



United States  
Department of  
Agriculture

Food and  
Nutrition  
Service

Office of  
Analysis,  
Nutrition, and  
Evaluation

## Measuring Food Security in the United States

# Guide to Measuring Household Food Security

**Revised 2000**

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This guidebook was prepared by Gary Bickel, USDA Food and Nutrition Service (FNS), Office of Analysis, Nutrition, and Evaluation, and Mark Nord, USDA Economic Research Service (ERS), Food and Rural Economics Division. It incorporates the original work of Cristofer Price and William Hamilton, Abt Associates, Inc. and John Cook, then of Tufts University Center on Hunger, Poverty, and Nutrition Policy and now of Boston University School of Medicine/New England Medical Center: *Guide to Implementing the Core Food Security Module* (cited as Price, et al., 1997). The present Revised Edition benefited from the review and comment of many colleagues, both within the federal interagency Food Security Measurement Project and among the project's many private-sector cooperators.

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# Guide to Measuring Household Food Security

Revised  
March, 2000

Number 6 in the Series  
Measuring Food Security in the United States:  
Reports of the Federal Interagency Food Security Measurement Project

Revised Edition of Report Number 3,  
"Guide to Implementing the Core Food Security Module," September 1997

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Food and Nutrition Service, USDA  
3101 Park Center Drive  
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May be cited as: Bickel, Gary, Mark Nord, Cristofer Price, William Hamilton, and John Cook:  
*Guide to Measuring Household Food Security, Revised 2000.* U.S. Department of  
Agriculture, Food and Nutrition Service, Alexandria VA. March, 2000.  
Or in short form as USDA,*Guide 2000.*

**TABLE OF CONTENTS**

Page

PREFACE TO THE REVISED EDITION ..... iii

INTRODUCTION.....1

Chapter One BACKGROUND OF THE HOUSEHOLD  
FOOD SECURITY MEASURE.....5

    What is Household Food Security?.....6

    Why Measure Food Security?.....7

    How is Food Security Measured? .....8

    What Is the Household Food Security Scale? .....9

    How Is the Household's Food Security Status Determined? .....11

    How Does the Household Measure Relate to the  
        Food Security of Individual Household Members? .....13

    Uses and Limitations of the Food Security Measure .....14

Chapter Two THE FOOD SECURITY QUESTIONNAIRE CORE MODULE.....18

    Overview of the CPS Food Security Supplement .....18

    Questions Included in the Core Module.....20

    Using Early Questions to Screen Out Food-Secure Respondents.....26

Chapter Three IMPLEMENTING THE FOOD SECURITY SCALE AND  
THE FOOD SECURITY STATUS MEASURE .....27

    Coding Survey Responses for the Food Security Scale .....27

    Assigning Scale Values to Households with Complete Responses  
        and Classifying Households by Food Security Status Level.....30

    Imputing Missing Values for Households with Incomplete Responses.....35

Chapter Four PRELIMINARY GUIDANCE ON SAMPLING LOCAL  
POPULATION GROUPS FOR FOOD SECURITY SURVEYS .....39

NOTES: Introduction and Chapter 1 .....42

        Chapters 2 and 3.....44

REFERENCES: Reports of the U.S. Food Security Measurement Project.....45

        Recent Literature Referencing the Food Security Measure .....46

**TABLE OF CONTENTS (continued)**

APPENDICES:		<u>Page</u>
Appendix A	THE FOOD SECURITY CORE-MODULE QUESTIONNAIRE.....	52
Appendix B	STANDARD 6-ITEM INDICATOR SET FOR CLASSIFYING HOUSEHOLDS BY FOOD SECURITY STATUS LEVEL .....	59
Appendix C	USING RASCH-MODEL SOFTWARE TO: (1) SCALE HOUSEHOLDS WITH MISSING ITEMS; (2) ASSESS DATA QUALITY; AND (3) ASSESS VALIDITY OF THE NATIONAL SCALE FOR SPECIAL POPULATION GROUPS.....	64
Appendix D	FURTHER TECHNICAL NOTES.....	73
EXHIBITS:		
Exhibit 2-1	Screening Question and Follow-up Items Not Used in Creating Scale .....	22
Exhibit 2-2	Questions Included in the Food Security Scale .....	23
Exhibit 3-1	Coding Survey Responses for the Food Security Scale .....	28
Exhibit 3-2	Two Measures of Severity of Household Food Insecurity and Hunger .....	31
Exhibit 3-3	Households with Complete Responses: Food Security Scale Values and Status Levels Corresponding to Number of Affirmative Responses.....	34
Exhibit B-1:	Table of Standard Values .....	62
Exhibit C-1:	Item Calibration Values: 1998 National Benchmark Levels.....	70
Exhibit C-2:	Alternative Standard Metrics for 1998 Scale Values .....	71
Exhibit D-1:	Correspondence of Item Numbers in the Core-Module Questionnaire and the CPS Food Security Supplements.....	74
Exhibit D-2:	Comparison of 1995 and 1998 Standard Household Scale Values .....	75

## **PREFACE TO THE REVISED EDITION**

Since publication of the *Guide to Implementing the Core Food Security Module* in 1997 by the Food and Nutrition Service (FNS, previously Food and Consumer Service) of the U.S. Department of Agriculture (USDA), the standard procedures for measuring food insecurity and hunger have undergone further refinement and development based on ongoing research within the federal interagency Food Security Measurement Project. This new edition of the *Guide* documents minor corrections and changes, bringing the procedures described in the original publication up to date. These include:

- Small changes in the format of the core-module questionnaire for consistency with the form adopted in 1998 for standard use in the annual Food Security Supplement to the Census Bureau's Current Population Survey (CPS), and other applications;
- Significant simplification and streamlining of the recommended procedure for scoring households with partially missing data;
- Revised and corrected scale-score ranges, based on 1998 data, for classifying households by food security status categories;
- An alternative, simple method of assigning households with complete core-module data to the food security status-level classifications; and
- Brief information on adapting the measure for particular survey uses.

None of these changes alters the content of the food security core-module questionnaire, the scaling method underlying the food security scale, or the basic method of classifying households by food security status level. Consequently, data collections and analyses based on the original *Guide* and on this Revised Edition can be fully consistent (although users of the original *Guide* should note the corrected and updated scale-score ranges presented here).

USDA actively encourages State- and local-area research and population monitoring applications of the standard national measure of household food security, as well as continued testing and validation research on the measure itself. We want to learn about your project and we invite you to call or email if you have questions, or if we can provide other help.

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The ERS Food Security Briefing Room ([www.ers.usda.gov/briefing/foodsecurity](http://www.ers.usda.gov/briefing/foodsecurity)) also provides additional technical information and references.

## INTRODUCTION

The presence of hunger in American households due to insufficient resources to obtain food has been a long-standing challenge to U.S. health, nutrition, and social policy. The success of the nation's nutrition-assistance safety net, beginning with the National School Lunch Program in 1946 and later under-girded by the Food Stamp Program and special programs for unusually vulnerable groups, has meant that extreme forms of hunger, common in Third-World countries, have been virtually eliminated in the United States. However, less severe forms of food insecurity and hunger--deprivation in basic need for food--are still found within the U.S. and remain a cause for concern. The basic policy tenet was forcefully stated by the President's Task Force on Food Assistance in 1984:

*It has long been an article of faith among the American people that no one in a land so blessed with plenty should go hungry. ...Hunger is simply not acceptable in our society.<sup>1</sup>*

The Task Force also noted that, up to the time of its Report:

*There is no official "hunger count" to estimate the number of hungry people, and so there are no hard data available to estimate the extent of hunger directly. .... We regret our inability to document the degree of hunger caused by income limitations, for such lack of definitive, quantitative proof contributes to a climate in which policy discussions become unhelpfully heated and unsubstantiated assertions are then substituted for hard information.<sup>2</sup>*

Now the tools do exist to document directly the extent of food insecurity and hunger caused by income limitations, as these conditions are experienced and reported by American households. Following the 1984 Task Force Report--indeed, in part stimulated by the report--private-sector researchers redoubled efforts to develop the kind of direct survey measure that could reliably and consistently document the extent of U.S. hunger. By the early 1990s, an extensive body of field experience had been gained and substantial consensus had emerged among nutrition experts on the sound conceptual and practical bases for such a measure.<sup>3</sup> Meanwhile, Congress enacted the National Nutrition Monitoring and Related Research Act of 1990, asserting the need for better monitoring and assessment of the nutritional state of the American people. The long-range plan formulated under the Act by the U. S. Departments of Agriculture (USDA) and Health and Human Services (DHHS) clarified the government's responsibility to help create a sound national measure of food insecurity and hunger.<sup>4</sup> A key requirement was that this measure should be appropriate for standard, consistent use "throughout the national nutrition monitoring system *and at State and local levels*" [emphasis added].

A federal interagency working group--the Food Security Measurement Project--was formed in 1992 to develop the needed measure, building upon the earlier research and working in close collaboration with private-sector experts and the U.S. Census Bureau. Throughout this development process, one objective held firmly in view was to make the final measure appropriate and feasible for use in locally designed and conducted food-security surveys.

We believe that this objective is achieved with the food-security core survey module, which currently is being used successfully in local applications throughout the U.S. and Canada. While the module may seem unduly long and repetitive at first sight, it generally requires less than four minutes of survey time to administer--under two minutes average in a full population sample with screening--while offering important strengths not available from single or small sets of indicators. The key strength of the measure, as explained below, is that its multiple indicator questions capture and distinguish the *various levels of severity* throughout *the full range of severity* with which the phenomenon of food insecurity/hunger is experienced in U.S. conditions. This feature is critical for accurately assessing the *prevalence* of food insecurity because the greater the severity, the less the prevalence and each separate indicator captures a *different degree* of severity. The frequency of the various indicators varies widely depending upon *exactly which* level of severity each one reflects.

Food insecurity is a complex, multidimensional phenomenon which varies through a continuum of successive stages as the condition becomes more severe. Each stage consists of characteristic conditions and experiences of food insufficiency to fully meet the basic needs of household members, and of the behavioral responses of household members to these conditions. A variety of indicators is needed to capture the various combinations of food conditions, experiences, and behaviors that, as a group, characterize each such stage. This is what the 18-item "core module" set of indicators provides.<sup>5</sup> The chapters below describe some of the characteristic aspects of the continuum of food insecurity and hunger, and Exhibit 3-2 (p.32) illustrates graphically the relationship of the food security measure to this continuum. An even larger, more detailed indicator set than the 18-item standard U.S. food security scale might do an even better job of measuring the severity of food insecurity/hunger--e.g., it could distinguish more fully among the various time paths of the experience (cyclical, episodic, prolonged, brief but intense, etc.) and among the alternative behavioral paths that reveal the various coping strategies that households employ in attempting to deal with food-resource inadequacy. However, for the main

purpose of assessing the prevalence of food insecurity/hunger at each of its several measurable levels of severity among U.S. households, the 18-item core module has been shown to be a stable, robust, and reliable measurement tool.

In addition, for circumstances in which limitations on survey time are insurmountable, a standard 6-item subset of the core-module indicator questions also has been developed, designed to capture reliably the first two thresholds identified in the full continuum measured by the food-security/hunger scale--i.e., the threshold of identifiable household food insecurity and the threshold of identifiable hunger among household members. Testing has shown this standard subset (Appendix B) to be significantly more reliable in classifying households accurately to the appropriate food security status level than alternative small, idiosyncratic sets of food-security indicators selected on impressionistic or "face-validity" grounds alone.

Local surveys that employ the systematic, tested, and validated indicator set provided by the core module for food security measurement, or the reduced standard 6-item partial set, can obtain findings that are readily interpretable. Such local survey findings can be compared directly with national and state-level standard benchmark statistics published annually by USDA and with many national- or regional-level tabulations of population subgroups available in the USDA reports. This food security benchmark data series is available from the U.S. Census Bureau, by CD-ROM or at the Bureau's website (<[www.census.gov](http://www.census.gov)> or <<http://ferret.bls.census.gov>>).

As an additional strength for comparative research with local survey findings, data from the standard food security Core Module also will be available from several specialized national surveys: the 5-year longitudinal Survey of Program Dynamics (SPD, conducted by the Census Bureau for DHHS, Office of the Assistant Secretary for Planning and Evaluation), the Early Childhood Longitudinal Study (ECLS, conducted by the U.S. Department of Education, National Center for Educational Statistics), the USDA Continuing Survey of Food Intakes by Individuals (CSFII), and the DHHS 4th National Health and Nutrition Examination Survey (NHANES-4).

The Core Module has been designed, not only for use in national surveys, but also for local groups wanting to determine the extent and severity of food insecurity and hunger within their own communities, using a technically well grounded and tested method to produce local prevalence estimates comparable with national and state-level standard benchmark figures. Local studies using either the

Core Module or the standard 6-item subset can play a key role in documenting the presence of hunger in the community as measured under standard national practice, in providing a sound base for broader community needs assessment, and in helping focus attention on unmet food-security needs within the community. When the Core Module is used to collect data on a periodic basis--as USDA is doing for national and state levels with the annual Food Security Supplement to the Current Population Survey--it also can provide systematic monitoring of the community's progress in addressing the hunger and other food-security needs within its midst.<sup>6</sup>

The next section (Chapter 1) presents the background description of food security measurement, slightly edited, from the 1997 *Guide to Implementing the Core Food Security Module*. The second chapter describes the data collected with the core module survey instrument. Chapter 3 gives updated guidance on how to score data collected with the module to produce prevalence estimates for food insecurity and hunger within the sampled population. The final chapter offers brief preliminary guidance on procedures for sampling within local population groups to assure that findings obtained from food-security surveys can be accurately interpreted and to avoid making unsupportable generalizations from the data collected.

In general, we recommend that any local group planning a food security survey seek to work cooperatively with university or other resource persons experienced in sample-survey work. Numerous sampling methods are available that are feasible and that can yield meaningful results, but expertise is needed to design these methods into your planned survey. Some experienced guidance at the initial planning and design stage of the study will pay off handsomely in helping to assure that the survey findings you obtain serve the purposes you intend, and that you and others can make valid interpretations of the findings.

## **Chapter One**

### **BACKGROUND OF THE HOUSEHOLD FOOD SECURITY MEASURE**

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In April 1995 the U.S. Census Bureau implemented the first Food Security Supplement to its Current Population Survey (CPS). The CPS Food Security Supplement is the cornerstone of the Food Security Measurement Project, a cooperative undertaking of federal government agencies and private-sector experts under the leadership of the Food and Nutrition Service (FNS) and Economic Research Service (ERS) of the U.S. Department of Agriculture (USDA) and the Centers for Disease Control and Prevention, National Center for Health Statistics (NCHS) of the U.S. Department of Health and Human Services.

The food security measurement project began in 1992 to carry out a key task assigned by the Ten-Year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program, established by act of Congress in 1990. This task was to develop a standard measure of food insecurity and hunger for the United States, for use at national, state, and local levels.

Based on detailed analysis and testing of the 1995 CPS data, a numerical food security scale and a related categorical food-security-status measure were developed to describe the food security situation of U.S. households during the preceding 12-month period.<sup>7</sup> Subsequent annual collection of the CPS food security data by the Census Bureau and further analysis and testing of the data have established the stability and robustness of the measure across years and across major population subgroups. The validated measure has now been used to present national and state-level statistics on household food security in the U.S. for 1995, 1996, 1997, and 1998. It is expected to serve a continuing role as the government's primary measure of this dimension of the well-being of the U.S. population.<sup>8</sup>

A regular report series has been established to present information on the food security measure, including annual estimates of the prevalence of food insecurity and hunger for the U.S. population and technical information on the development and testing of the measure (see References below). This Guide is intended to supplement the regular reports by providing operational information

to researchers, evaluators, and others interested in implementing the standard national food security measure within their own work.

This chapter provides a brief review of key definitions and explanations of the food security scale and its associated categorical status measure. It describes the kinds of situations in which either or both forms of the measure may be applicable. For a fuller explanation of the conceptual and technical underpinnings of the measure, readers are referred to the project's main reports and recent professional journal literature on the measure. Chapter Two presents the questions that must be asked to construct the measure (the questionnaire "core module") and Chapter Three describes the procedures for assigning food security scale values to surveyed households and for determining the categorical food security status of the household.

### **What Is Household Food Security?**

Extensive research in the late 1980s focused on understanding household food security, food insecurity, and hunger. This work led to the development by an expert working group of the American Institute of Nutrition of the following conceptual definitions, which were published in 1990 by the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology:

- ***Food security*** — “Access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies).”
- ***Food insecurity*** — “Limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.”
- ***Hunger*** — “The uneasy or painful sensation caused by a lack of food. The recurrent and involuntary lack of access to food. Hunger may produce malnutrition over time.... Hunger ... is a potential, although not necessary, consequence of food insecurity.”

Food insecurity and hunger, as the terms are used here, are conditions resulting from *financial resource constraint*. Hunger, for example, can occur in many situations, including dieting and being too busy to eat. The measurement procedure described here, however, is concerned only with food insecurity and hunger that occur because the household does not have enough food or money to buy

food. Hunger, in this perspective, may be seen as a severe stage or level of food insecurity, rather than as a distinct or separate condition from the more general experience of food insecurity. Moreover, while this condition is usually associated with poverty, it is not the same thing as general income inadequacy.<sup>9</sup> Rather, it is the condition of deprivation in this one area of basic need; its measurement captures the severity of deprivation due to resource constraint in this one specific area of need, as directly experienced and described by respondents.

### **Why Measure Food Security?**

One of the continuing aims of U.S. public policy in the latter half of the 20th century has been to assure that all Americans have enough to eat. Recently, the United States joined 185 other nations in signing the Declaration of Rome at the 1996 International Food Summit, pledging to reduce by at least half the prevalence of hunger, each within its own jurisdiction, by a target date early in the 21st century. Current USDA policy is to achieve this goal for the United States by the year 2010.

Whether viewed globally, within the nation, the state, or in local communities, food security is an essential, universal dimension of household and personal well-being. The deprivation of basic need represented by food insecurity and hunger are undesirable in their own right and also are possible precursors to nutritional, health, and developmental problems. Monitoring food security can help to identify and understand this basic aspect of well-being of the population and to identify population subgroups or regions with unusually severe conditions.

Numerous public and private nutrition assistance programs, operating at national, state, and local levels, serve to ameliorate food insecurity and hunger in the United States. Accurate measurement and monitoring of these conditions can help public officials, policy makers, service providers, and the public at large to assess the changing needs for assistance and the effectiveness of existing programs. In the context of current movements in the U.S. to expand and enhance food security and eliminate remaining hunger through planning and action at the community level, determining the food security status of the households comprising the community can provide an indispensable tool for assessment and planning.

Traditional income and poverty measures do not provide clear information about food security, even though food insecurity and hunger stem from constrained financial resources. Analysis of

food security data shows that many low-income households appear to be food secure, whereas a small percentage of non-poor households appear insecure. The reasons for these differences are not yet well understood, although they probably include unexpected changes in circumstances, variations in household decisions about how to handle competing demands for limited resources, and geographic patterns of relative costs and availability of food and other basic necessities, such as housing. The food security measure provides independent, more specific information on this dimension of well-being than can be inferred from income data alone.

### **How Is Food Security Measured?**

The full range of food insecurity and hunger cannot be captured by any single indicator. Instead, a household's level of food insecurity or hunger must be determined by obtaining information on a variety of specific conditions, experiences, and behaviors that serve as indicators of the varying degrees of severity of the condition. Household surveys, usually conducted in person or by telephone, are used to get this information. Research over the past two decades has identified a particular set of this kind of condition, experience and behavior pattern that consistently characterizes the phenomenon of food insecurity and hunger.<sup>10</sup> Established questions for many of these potential indicators were included in the 1995 CPS Food Security Supplement, which became the basis for the food security scale measure that then was developed from the CPS data. Specifically, the CPS "core module" of food security questions--the key section of the CPS Food Security Supplement--asks about the following kinds of household conditions, events, behaviors, and subjective reactions:

- Anxiety that the household food budget or food supply may be insufficient to meet basic needs;
- The experience of running out of food, without money to obtain more;
- Perceptions by the respondent that the food eaten by household members was inadequate in quality or quantity;
- Adjustments to normal food use, substituting fewer and cheaper foods than usual;
- Instances of reduced food intake by adults in the household, or consequences of reduced intake such as the physical sensation of hunger or loss of weight; and
- Instances of reduced food intake, or consequences of reduced intake, for children in the household.

All of the core-module food security questions have two characteristics in common. Each question aims to assure that the reported behavior or condition occurred because of household financial limitations by including phrases such as “because we couldn’t afford that” or “because there wasn’t enough money for food.” Also, each question asks explicitly about circumstances that occurred during the past 12 months (although see p. 25 below).

The topics covered by the food security questions reflect the findings of previous research, which show that households go through different experiential and behavioral stages as food insecurity becomes more severe. In the first stage, households experience inadequacy in food supplies and food budgets, feel anxiety about the sufficiency of their food to meet basic needs, and make adjustments to their food budgets and types of food served. As the situation becomes more severe, the food intake of adults is reduced and adults experience hunger, but they spare the children this experience. In the third stage, children also suffer reduced food intake and hunger and adults’ reductions in food intake are more dramatic. Not all households fits this pattern in exactly the same way, but U.S. households generally show a high degree of commonality in their patterns of perception and response to experienced food inadequacy across these several levels or ranges of severity.

Although the core-module questions cover the key central dimensions of household food insecurity, they do not represent all aspects of the phenomenon. The questions focus on whether the household has *enough* food or money to meet its basic food needs and on the normal behavioral and subjective responses to that condition, as these have been observed. Other elements of the broad, conceptual definition of food security, such as food safety, nutritional quality of diets, and “social acceptability” of food sources—including the unusual and sometimes ingenious coping behaviors that food-insecure households may undertake to augment their food supply, are not measured by the food security scale.<sup>11</sup> Similarly, other possible sources of household food insecurity apart from financial constraint, such as reduced mobility or function for isolated elderly or ill persons, are not captured by the measure.

### **What Is the Household Food Security Scale?**

The set of food security questions included in the core survey module can be combined into a single overall measure called the food security scale. This is a continuous, linear scale which measures

the degree of severity of food insecurity/hunger experienced by a household in terms of a single numerical value. These scale values vary across a wide range that expresses the full range of severity of food insecurity/hunger as observed in U.S. households. The unit of measure used for the scale is a matter of convention. For the main presentation of the measure and methods in this *Guide*, the unit of measure has been chosen such that the full range of severity measured by the standard U.S. food security scale is expressed by numerical values ranging from 0 to 10.<sup>12</sup>

The statistical procedure that determines a household's scale value is rather complicated, but fundamentally it depends on the *number* of increasingly severe indications of food insecurity that the household has experienced, as indicated by affirmative responses to the increasingly severe *sequence* of survey questions. A household with a scale value of 6, for example, has responded affirmatively to *more*, and typically to *more severe*, indicators of food insecurity than a household with a scale value of 3. A household that has not experienced any of the conditions of food insecurity covered by the core-module questions will be assigned a scale value of 0, while a household that has experienced all of them will have a scale value close to 10.

In general, the set of core-module questions works systematically together to provide a measurement tool for identifying, with considerable sensitivity, the level of severity of food insecurity/hunger experienced in a household. Prior to the application of scaled measurement methods to the phenomenon of food insecurity/hunger, a common way of thinking was to see this as a simple, either-or condition, capable of being identified by one or two indicators. Earlier discussion often focused on which indicator, or small set of indicators, was the "right" one. By contrast, the conceptual and technical advances achieved over the past 15 years in measuring food insecurity and hunger have emphasized the continuity of the phenomenon, with hunger understood as a more severe stage "nested within" the broader condition of food insecurity. To guard against simplistic interpretations, documentation for the original 1995 CPS Food Security Supplement emphasized the systematic nature of the core module in the following language:

*Responses to individual items in this supplement are not, taken alone or in themselves, meaningful measures of food insufficiency, food insecurity, or hunger, and should not be used in such a manner.*<sup>13</sup>

In interpreting the scale, it also is important to remember that what it measures is the sufficiency of household food as directly experienced by household members and not necessarily the

nutritional adequacy of diets as a nutritionist would measure it. It is reasonable to expect that households with higher scale values have nutritionally less adequate diets than households with lower scale values, but one cannot draw that conclusion from the scale values alone.<sup>14</sup>

Note also that the scale represents the condition of *household members as a group*, not necessarily the condition of any particular person in the household. Some questions apply to the household as a whole, such as “the food we bought just didn’t last, and we didn’t have money to get more.” Others ask about the experience of adults in the household as a group, or children as a group. If the household includes more than one adult or more than one child, the core-module questions do not tell us how many or which of the adults or children experienced the condition.<sup>15</sup>

In the national data, the large majority of households have scale values of 0, indicating that within the past year they did not experience any of the conditions of food insecurity covered in the core-module questions. Only a tiny fraction of households have values close to the most severe level of food insecurity measured by the questions. Surveys measuring food insecurity for special populations—particularly low-income populations—usually show higher average scale values, but it is still likely that in current U.S. population surveys most household scale values will be concentrated at the lower end of the range.

### **How Is the Household's Food Security Status Determined?**

It is often useful, both for policy and research purposes, to simplify the food security scale into a small set of categories, each one representing a meaningful *range of severity* on the underlying scale, and to discuss the percentage of the population in each of these categories. Four categories have been defined for this purpose:

- ***Food secure*** — Households show no or minimal evidence of food insecurity.
- ***Food insecure without hunger*** — Food insecurity is evident in household members’ concerns about adequacy of the household food supply and in adjustments to household food management, including reduced quality of food and increased unusual coping patterns. Little or no reduction in members’ food intake is reported.
- ***Food insecure with hunger (moderate)*** — Food intake for adults in the household has been reduced to an extent that implies that adults have repeatedly experienced the physical sensation of hunger. In most (but not all) food-insecure households with children, such reductions are not observed at this stage for children.

- ***Food insecure with hunger (severe)*** — At this level, all households with children have reduced the children's food intake to an extent indicating that the children have experienced hunger. For some other households with children, this already has occurred at an earlier stage of severity. Adults in households with and without children have repeatedly experienced more extensive reductions in food intake.

Sometimes it is preferable to combine the third and fourth groups into a single broader category and to use the term ***food insecure with hunger*** for the combined categories.

A household is classified into one of the food security status-level categories on the basis of its score on the food security scale, while the household's scale score is determined by its overall pattern of response to the set of indicator questions. Households with very low scale scores are those that report no, or very limited, food-insecurity or hunger experiences. These households are classified as food secure. At the other extreme, households with very high scale scores are those that have reported a large number of the conditions and are classified as food insecure with hunger (severe)--i.e., with hunger at the most severe level measured in the U.S.

The more meaningful separations are those that fall in the middle ranges of the scale. Here, households that affirm at least three of the indicator conditions are classified as food insecure. Most of these are classified "*food insecure without hunger,*" as the presence of enough indicators, of sufficient severity level to establish confidently the presence of hunger among household members, is lacking. A smaller number of the food-insecure households show measured severity levels higher up the scale, and have affirmed at least three of the (usually adult) hunger indicators. These households are deemed to be reporting enough indications of food insecurity and reduced food intake to establish a high probability of hunger among household members, and accordingly are classified "*food insecure with hunger.*"

These relationships between the several stages or levels of severity of food insecurity and how they are captured in operational terms are discussed further in Chapter 3. **Exhibit 3-2** (p.32) illustrates graphically the underlying continuum of conditions and experience that characterizes food insecurity and hunger, and the alternative ways in which the two forms of the food security measure--the continuous food security *scale* and the ranges of severity defining the food security status-level *categories*--quantify that continuum.

### **How Does the Household Measure Relate to the Food Security of Individual Household Members?**

The food security scale represents the condition of *household members as a group*, and not necessarily the condition of any particular household member. In general, conditions of food insecurity are believed to affect all household members, although not necessarily in the same way. By contrast, hunger is a uniquely individual phenomenon--some members of the household may be hungry while others are not. Consequently, when the scale measure classifies a household into the more severe range, food insecure with hunger, what it tells us is that at least some member, or members, of the household are experiencing hunger due to insufficiency of household resources, but not necessarily all members. The resultant prevalence figures for the estimated number and percent of households that are food insecure with hunger thus need to be interpreted carefully. These are households with evidence to indicate that some member(s) has\have been hungry due to lack of resources at least sometime during the prior 12 months, but not necessarily all members and not necessarily in all, or even most, months.

Similarly, the estimated numbers of all persons--adults and children--in households that are food insecure with hunger need to be interpreted carefully. Not all such individuals necessarily have experienced hunger within the survey period, based on strict interpretation of what the data tell us. For adults in such households this distinction may not be very important. That is, when the household is impacted by food insecurity due to inadequate resources for food, at the level of seriousness such that any adult members are experiencing hunger, preliminary evidence suggests that most, if not all, adults in the household are likely to be similarly hungry.<sup>16</sup>

However, the situation for children in the household appears to be quite different. That is, when the household is reporting conditions of food insecurity severe enough to provide clear evidence of hunger for adults, this in itself does not indicate that children in the household are hungry, especially if they are young children. The common pattern of behavior in most U.S. households with children--and especially in those with younger children--is for adults to undergo comparatively severe levels of hunger for themselves before the first indications of hunger appear among the children. Thus, in households with children that are classified "food insecure with hunger (moderate)," the food security measure shows clear evidence of adults' hunger but does not *necessarily* show evidence of children's hunger. Consequently, the only inferences about children's hunger that can be made confidently from the unidimensional household-level food security measure is that children in food-insecure households are at

*significantly higher risk* of hunger than other children, and that this risk rises sharply as the severity level of the food insecurity experienced in the household rises.

The most severe category specified in the original design of the household measure, the category designated "food insecure with hunger (severe)," was intended to provide a proxy estimate of children's hunger when applied to households with children. At this level of severity (0.8 percent of all households in 1995) households with children do indeed all show clear evidence of children's hunger, while adults in the same households (as well as in households without children at the same severity level) are reporting going whole days without eating due to lack of resources. However, using this categorical measure based on the unidimensional household scale as a proxy for children's hunger is problematic because it *misses* substantial numbers of households that also show clear evidence of children's hunger, even though, as households, they do not reach the overall level of severity that defines the food-insecure-with-hunger-(severe) category. In other words, some households do not fit the common behavioral pattern. Instead, their response patterns indicate that children in these households--and especially if they are older children--are hungry at nearly the same severity level of overall household food insecurity at which adult hunger indicators appear.

In order to address this problem more directly, an associated measurement scale oriented exclusively to the child-specific food-insecurity and hunger indicators included in the core module, and estimated solely for households with children, is under development by USDA. Future reports of the Food Security Measurement Project will include information and national benchmark estimates based on this "children's hunger scale" derived from the core module in essentially the same way as the established, unidimensional household-level food security scale. USDA also will provide updated guidance and assistance on scoring local survey data based on the core module to produce standard estimates of the number and percent of households with children's hunger, as measured by the local survey data.

### **Uses and Limitations of the Food Security Measure**

USDA has compiled and reported national and state-level annual statistics on household food security beginning with the CPS Food Security Supplement data collected in April 1995. This first round of data collection and the initial analytic work establishing the measurement scale were reported in 1997, inaugurating the USDA report series, *Measuring Food Security in the United States* (see References). Two more reports in the series were released in 1999, *Household Food Security in the*

*United States, 1995-1998: Advance Report; and Prevalence of Food Insecurity and Hunger, by State, 1996-1998.* Additional full reports for the periods 1995-1997 and 1998-1999 are in preparation.

The data files upon which the USDA report series is based provide a standard, consistent benchmark series of national and state-level food-security and hunger data, along with data on use of food and nutrition assistance programs, food expenditures, and use of emergency food resources, for use by researchers and analysts. These annual files of the CPS Food Security Supplement are maintained by the U.S. Bureau of the Census and are available to the public, either in CD-ROM or from the Census Bureau web site (<[www.census.gov](http://www.census.gov)> or <<http://ferret.bls.census.gov>>). Currently (January, 2000) these public data files are available for 1995 through 1998.

The core set of questions from the food security supplement—the "core module" presented in Appendix A—also has been included in a number of national surveys, including the planned Continuing Survey of Food Intakes by Individuals (CSFII), the planned Fourth National Health and Nutrition Examination Survey (NHANES-4), the 5-year Early Childhood Longitudinal Study (ECLS), the 1997 Panel Survey of Income Dynamics (PSID), and the 5-year Survey of Program Dynamics (SPD). Thus, a great deal of information is or soon will be available, not only on the annual benchmark levels of household food insecurity and hunger in the population generally, but also on the food security status of special population groups (e.g., pre-school and elementary school-aged children; welfare leavers; population groups identified by health and dietary status).

These rich national data sources can be expected to provide a backdrop for many researchers interested in measuring food security within their own populations of interest and in examining the relationships of food security to nutrition, health, and other dimensions of household and personal well-being. Examples of the types of research that may use food security measures include the following:

- ***Food security monitoring studies*** of particular locations or particular populations. Such studies may compare the local food security situation to state and national patterns, assess the local need for food assistance, or track the effect of changing policies or economic conditions.
- ***Food assistance program evaluations*** may measure food security as a needs indicator, and *changes* in food security as an outcome indicator. For example, the food security status of program participants over time may be compared to the progress of comparable households not receiving the assistance.

- ***Other studies of low-income populations*** may include food security as one of the dimensions of household and personal well-being that are considered.
- ***Community needs assessment and monitoring studies*** may include measures of food-insecurity and hunger prevalence within the local population as a fundamental component of a "community food security status" profile, developed to assess needs, to compare the community against others, and to track progress in reducing food insecurity and hunger within the community.
- ***Research studies of community food security*** may develop community-level descriptors of food access and availability, food safety, food program access, economic development indices, and similar factors for use in analyzing the relationships between such factors and the underlying level of household food security in the community.

The material presented in this Guide is intended to assist researchers in implementing household food security measures in such situations. It also is important, however, for researchers to be aware of the limitations of the measure. Points to bear in mind include:

- The food security scale does not capture all possible dimensions of food insecurity. It does not measure food safety, nutritional status, or the availability of food through “socially acceptable” channels, nor does it measure community-level factors such as the nature and sources of the available food supply.
- The U.S. standard food security measure reflects the household’s situation over the 12 months before the interview (although the core module can be adapted to other survey periods--see p. 25 below). A household that experienced food insecurity at some time during the past year (or other period), and therefore is considered food insecure, may in fact be food secure at the time of the interview.
- Each of the specific boundaries used to identify categories of the food security status variable could be debated, with some people arguing that the boundary understates the number of households that are “truly” in a category, and others arguing that the boundary exaggerates the number. The status categories are therefore most useful in making comparisons. As long as the boundary is defined and measured consistently, one can be reasonably sure that an increase or decrease in the percent of households classified in a category represents a true increase or decrease in the number of households experiencing that general level of food insecurity or hunger.
- The food security scale has been found reliable for describing the status of a population. It has not yet been proven reliable for assessing the status of an individual household, as in a clinical screening context.

- USDA expects to refine and improve the food security questions and scale over time. Researchers should obtain the most current version of the questions and scale from the ERS web site to maximize comparability with national statistics.
- A set of companion scales based on severity-level indicators for *individual* adult and child household members is under development. Preliminary results from a test subsample in the CPS using items referenced to specific individuals (i.e., the respondent adult and a specific child selected at random) have demonstrated the feasibility of this approach. Development of such scales will be based on NHANES-4 and CSFII data sets, planned to include both the full household-level core module and individual-level variants of the core-module questions.
- The food security measure has been developed for households in the United States, reflecting the relevant range of conditions in this country. The same methodology is expected to be applicable in other settings, with appropriate linguistic and cultural translations for the exact forms of the scale questions and independent estimation of scale values, reflecting the characteristic patterns of perception and response within the sampled population.

Used carefully, the food security measure is expected to prove useful in a wide variety of monitoring, evaluation, and research settings. The remainder of this Guide presents information on how to implement the U.S. standard core-module question set and measurement scale.

## Chapter Two

### THE FOOD SECURITY QUESTIONNAIRE CORE MODULE

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The first round of data from the CPS Food Security Supplement (1995) was analyzed to determine if a one-dimensional measurement scale could be found that would “fit” the data in a statistical sense while corresponding to the known facts concerning food insecurity and hunger. That is, a measure was sought for the *severity* of household food insecurity, as this condition of deprivation in basic need for food had come to be understood from the existing research findings. Measuring the severity of food insecurity at the *various* levels at which households experience it is a necessary step in estimating the *prevalence* of food insecurity at any *specified* level of severity in a population. The final result of these extensive exploratory analyses, tests, and validations was to identify a set of 18 questions from among more than 30 potential CPS indicator items tested, based on goodness-of-fit and other properties needed in a reliable measurement scale.

This final set of 18 questions provides the indicator variables that underlie the standard measurement scale for severity of U.S. food insecurity and hunger. This question set, termed the "core module" for U.S. food security measurement, covers the full range of severity observed under current U.S. conditions for households both with and without children. Each household's overall pattern of response to these questions determines its score on the food security scale and its classification by food-security status level.

This chapter describes the contents of the CPS Food Security Supplement, the contents of the core module, the USDA general food sufficiency question, and screening procedures that may be used to reduce respondent burden. Appendix A presents the core-module questions in survey-instrument form, showing response categories, alternative phrasings for use according to composition of the household, and screening specifications. Appendix B presents the 6-item subset of core module questions determined to be the optimal set of that size for classifying households consistently with the standard food-security-status measure defined in reference to the core module. The exhibits presented in this chapter show the questions in more compact form.

#### Overview of the CPS Food Security Supplement

The Food Security Supplement to the Census Bureau's Current Population Survey (CPS)

includes many questions in addition to the core module for food-security measurement. It is a battery of some 50-60 questions, many with multiple parts, designed to cover diverse aspects of household food use and experience. The supplement covers four major areas related, directly or indirectly, to food security:

- household food expenditures (actual, usual, and "least amount needed");
- participation in public food assistance programs;
- coping behaviors to augment food supply from emergency sources (e.g., borrowing, food pantry use, etc.); and
- direct indicators of food insecurity and hunger (12-month and 30-day bases).

Several broad preliminary screening questions are included in the CPS supplement immediately following the opening food-expenditure section. These serve to identify food-secure households among higher-income respondents to the CPS so that these can be screened from the main part of the supplement: the food-assistance, coping-strategy, and food-security sections.

All items in the latter two groups of questions, plus the preliminary screener questions, were tested for the 12-month food-security scale. Based on these test results, the questions may be grouped along the following lines:

- the 18 food security questions found to provide the statistically strongest set of indicator items for constructing a 12-month measurement scale;
- Questions used in constructing a 30-day scale;<sup>17</sup> and
- Questions that failed to meet statistical criteria for inclusion in the 12-month scale. These include:
  - some direct food security items (dropped from subsequent supplements);
  - three broad preliminary screening questions (one subsequently dropped); and
  - five food-augmenting coping items, as a group (modified and retained).

The core-module set of food security indicators may be used in stand-alone form or as a segment in larger questionnaires. Some researchers may also want to use other questions from the CPS food security supplement. The supplement's content has varied slightly over the 1995-98 period, primarily in the detail collected in the food-expenditure section and through inclusion of experimental variations of selected food-security and screening items for testing purposes. However, the core-

module questions have remained constant in all years. The complete questionnaire used for the CPS food security supplement in each year is available on the ERS web site ([www.econ.ag.gov](http://www.econ.ag.gov)). Note that the food spending series has varied substantially from year to year in the level of detail collected, so researchers working with those data may want to compare several years' questionnaires.

### **Questions Included in the Core Module**

The core-module questionnaire (Appendix A) contains the core module itself--i.e., the questions that underlie the 12-month food security scale in survey-instrument form--and an optional introductory question, with follow-ups. The optional first question may be used as a preliminary screener for higher-income households, or as part of the first-stage screener in the core module proper, and/or for its additional information content. It and its follow-ups are not used in forming the food security scale. The core module proper (Q2-Q16, plus three skip-pattern follow-up questions) provides the smallest set of indicators that will allow implementation of the full range of the food security scale. Asking all of the questions in the core module takes about four minutes. If the screening procedures described below are used, most respondents will not be asked the full set of questions, reducing average interview time. The core module is estimated to take approximately two minutes of interview time, on average, in a general population survey when the recommended screening procedures are used. Surveys targeted to population groups that are more food-insecure than average will require average interview times greater than two minutes, but still less than four minutes if the screening procedures are used.

**The Abbreviated 6-Item Subset.** If the 18 items are too many for your survey, a standard 6-item version also has been developed (Appendix B) that has been shown to approximate closely the three main categories of the food-security-status measure: i.e., "food secure," "food insecure without hunger," and "food insecure with hunger." Statistical testing was used to identify the strongest available subset of six indicators for achieving a good approximation to the first three categories of the food security measure, with only slight loss in sensitivity or specificity.<sup>18</sup> For many research and monitoring purposes this somewhat less reliable measure may be adequate. The main weakness of the 6-item measure, in comparison to the full scale, is that it does not capture the more severe range of food insecurity where children's hunger and more severe adult hunger occur. Consequently, the more

abbreviated measure only provides one limited piece of information concerning children's hunger: for households that reach the severity level of "food insecure with hunger" (i.e., a pattern of at least five affirmative responses on the six indicators), the *probability* that children in the household were hungry in the survey period is much greater than for other children. That is, the measure provides a sound indicator of the *risk* of children's hunger, in this sense.

Preliminary testing has shown that the 6-item subset also may be implemented with an internal screener, comparable to the first-level internal screen recommended for use within the core module, with very little further reduction in reliability.

**The USDA Food Sufficiency Question.** Questionnaire items 1, 1a, and 1b, shown in **Exhibit 2-1**, are not part of the actual scale but are included for optional use. Q1 has a long history of use in USDA national food surveys and, in modified form, in NHANES-3 and other surveys. Thus, it can provide a single-question measure which has tie-in to earlier literature, even though it is a substantially weaker measure than either the 18-item scale or the 6-item subset. For households whose response to Q1 indicates a condition short of full food sufficiency, Q1a or Q1b may be asked as follow-ups. These five-part questions are designed to provide further information on circumstances that may be connected to conditions of food insecurity.

Question 1 also may be used in combination with household income to construct a preliminary screener for higher-income respondents, as is done for burden reduction in the CPS supplement. Households with incomes above twice the poverty threshold, AND who respond <1> to Question 1, may be skipped to the end of the module and classified as food secure. Use of this preliminary screener reduces total burden in a sample which includes many higher-income households, and the loss of sensitivity in identifying food-insecure households is very slight. However, research has shown that a very small proportion of the higher-income households screened out by this procedure will register food insecurity if administered the full module. If Question 1 is not needed for research purposes, a preferred strategy is to omit Question 1 and administer Stage 1 of the module to all households. Administration time for Stage 1 is very nearly the same as administration time for the preliminary food sufficiency question. Question 1 also can be used *in combination with* Stage 1 of the module to implement the first level of internal screening (making the screen marginally "looser"), as described below, but this is not essential.

**Exhibit 2-1**

**SCREENING QUESTION AND FOLLOW-UP ITEMS  
NOT USED IN CREATING SCALE**

<b>Question Number*</b>	<b>Question</b>
Q1	Which of these statements best describes the food eaten in your household in the last 12 months: we always have enough to eat and the kinds of food we want; we have enough to eat but not always the <u>kinds</u> of food we want; sometimes we don't have <u>enough</u> to eat; or <u>often</u> we don't have enough to eat?
Q1a	<p><i>(IF SOMETIMES OR OFTEN NOT ENOUGH TO EAT)</i> Here are some reasons why people don't always have enough to eat. For each one, please tell me if that is a reason why <u>you</u> don't always have enough to eat.</p> <ul style="list-style-type: none"> <li>Not enough money for food</li> <li>Too hard to get to the store</li> <li>On a diet</li> <li>No working stove available</li> <li>Not able to cook or eat because of health problems</li> </ul>
Q1b	<p><i>(IF ENOUGH FOOD, BUT NOT THE KINDS WE WANT)</i> Here are some reasons why people don't always have the kinds of food they want or need. For each one, please tell me if that is a reason why <u>you</u> don't always have the kinds of food you want or need.</p> <ul style="list-style-type: none"> <li>Not enough money for food</li> <li>Too hard to get to the store</li> <li>On a diet</li> <li>Kinds of food we want not available</li> <li>Good quality food not available</li> </ul>

\* See Appendix D, technical note 1, for comparison of core-module item numbers and CPS Supplement numbers for the same items.

**Questions in the Food Security Scale.** The food security scale is based on responses to questions Q2 to Q16, which are summarized in **Exhibit 2-2** and presented in full in Appendix A. These questions capture four kinds of situations or events, all related to the general definition of food insecurity presented earlier. These include both qualitative and quantitative aspects of the household's food supply as well as household members' psychological and behavioral responses.

Exhibit 2-2

QUESTIONS INCLUDED IN THE FOOD SECURITY SCALE

Question Number*	Question
<i>Optional Preliminary Screen</i>	
<b>Stage 1:</b>	
Q2	<p>Now I'm going to read you several statements that people have made about their food situation. Please tell me whether the statement was often, sometimes, or never true in the last 12 months.</p> <p><i>"I worried whether our food would run out</i> before we got money to buy more." Was that often, sometimes, or never true for you in the last 12 months?</p>
Q3	<p><i>"The food that we bought just didn't last,</i> and we didn't have money to get more." Was that often, sometimes, or never true for you in the last 12 months?</p>
Q4	<p><i>"We couldn't afford to eat balanced meals."</i> Was that often, sometimes, or never true for you in the last 12 months?</p>
Q5**	<p><i>"We relied on only a few kinds of low-cost food to feed the children</i> because we were running out of money to buy food." Was that often, sometimes, or never true for you in the last 12 months?</p>
Q6**	<p><i>"We couldn't feed the children a balanced meal</i> because we couldn't afford that." Was that often, sometimes, or never true for you in the last 12 months?</p>
<i>1<sup>st</sup>-Level Internal Screen</i>	
<b>Stage 2:</b>	
Q7**	<p><i>"The children were not eating enough</i> because we just couldn't afford enough food." Was that often, sometimes, or never true for you in the last 12 months?</p>
Q8, Q8a	<p>In the last 12 months, did <i>you or other adults</i> in your household ever <i>cut the size of your meals or skip meals</i> because there wasn't enough money for food?</p> <p>Q8a How often did this happen — almost every month, some months but not every month, or in only one or two months?</p>
Q9	<p>In the last 12 months, did you ever <i>eat less than you felt you should</i> because there wasn't enough money to buy food?</p>
Q10	<p>In the last 12 months, were you ever <i>hungry but didn't eat</i> because you couldn't afford enough food?</p>
Q11	<p>Sometimes people lose weight because they don't have enough to eat. In the last 12 months, did you <i>lose weight</i> because there wasn't enough food?</p>

Exhibit 2-2 (continued)

QUESTIONS INCLUDED IN THE FOOD SECURITY SCALE

Question Number*	Question
<i>2<sup>nd</sup>-Level Internal Screen</i>	
<b>Stage 3:</b>	
Q12,	In the last 12 months, did <i>you or other adults</i> in your household ever <i>not eat for a whole day</i> because there wasn't enough money for food?
Q12a	How often did this happen — almost every month, some months but not every month, or in only one or two months?
Q13**	In the last 12 months, did you ever <i>cut the size of any of the children's meals</i> because there wasn't enough money for food?
Q14,**	In the last 12 months, did any of the <i>children ever skip meals</i> because there wasn't enough money for food?
Q14a**	How often did this happen — almost every month, some months but not every month, or in only one or two months?
Q15**	In the last 12 months, were the <i>children ever hungry</i> but you just couldn't afford more food?
Q16**	In the last 12 months, did any of the <i>children ever not eat for a whole day</i> because there wasn't enough money for food?

\* See Appendix D, technical note 1 for comparison of core-module item numbers and CPS Supplement numbers for the same items.

\*\* Questions asked only of households with children. Children are defined as persons age 0-17--i.e., less than 18 years old--(but see note 22 in Endnotes).

The four kinds of situation are:

- Anxiety or perception that the household food budget or food supply was inadequate (Q2, Q3);
- Perceptions that the food eaten by adults or children was inadequate in quality (Q4, Q5, Q6);
- Reported instances of reduced food intake, or consequences of reduced intake, for adults (Q8, Q8a, Q9, Q10, Q11, Q12, Q12a); and
- Reported instances of reduced food intake or its consequences for children (Q7, Q13, Q14, Q14a, Q15, Q16).



## Using Early Questions to Screen Out Food-Secure Respondents

Research to date has shown that the great majority of American households are food secure. This means that a large proportion of respondents in a general population survey will not have experienced any of the food-insecurity conditions that the questions ask about. Researchers may wish to “screen out” households that are clearly food secure, and thereby avoid asking the full set of questions to households that can confidently be judged to have experienced none of the relevant conditions.

The questionnaire is organized to ask first about less severe conditions of food insecurity and subsequently about the more severe conditions. Thus, a household that gives uniformly negative responses to the early questions will have a very low likelihood of having experienced any conditions of food insecurity and can safely be deemed to be food secure. Such respondents need not be asked the remaining questions. Two levels of screening are suggested:

- **First-level screen, omitting Q1.** Questions Q7 to Q16 may be skipped for households that meet the following criterion:
  - They respond “never true” (or "DK" or "R")<sup>19</sup> to all five of questions Q2 to Q6 (or to the first three if the household has no children).
- **First-level screen, including optional Q1.** Questions Q7 to Q16 may be skipped for households who meet the following criteria:
  - Their response to Q1 is “we always have enough to eat and the kinds of food we want” (or "DK" or "R") **and**
  - They respond “never true” (or "DK" or "R") to all five of questions Q2 to Q6 (or to the first three if the household has no children).
- **Second-level screen.** For households not previously screened out, Q12 to Q16 may be omitted if the household meets the following criteria:
  - Their response to Q7 is “never true” (or "DK" or "R") (households with children) **and**
  - Their response is “no” (or "DK" or "R") to all four of Q8 to Q11.

The survey may be implemented using either one of the screens separately or using both in tandem. Although the design supports these two levels of screening, not all researchers will want to apply the screens. This is entirely acceptable from a technical point of view. The only reason for using the screens is to limit the burden placed on survey respondents and/or to reduce the awkwardness felt by interviewers in asking clearly inappropriate questions. Applying the screens has little benefit if respondent burden is a minor issue—for example, in short surveys or surveys of groups in which most respondents are expected to have experienced food insecurity.

## Chapter Three

### IMPLEMENTING THE FOOD SECURITY SCALE AND THE FOOD SECURITY STATUS MEASURE

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This chapter describes the operational steps required for: (1) converting the survey responses collected using the core-module questionnaire into the data set needed for applying the measurement model; (2) applying the model to the data to determine the food security status level of each household; and (3) determining, for those households that show evidence of food-insecurity/hunger, the severity level of the condition experienced. The discussion covers procedures for coding the questions, for assigning food-security scale values to households, and for classifying households into the appropriate food security status-level categories.

#### Coding Survey Responses for the Food Security Scale

In order to determine households' scores on the food security scale, it is first necessary to code their response to each question as either “affirmative” or “negative.” Some of this coding is obvious because the only response choices are “yes” or “no.” Two groups of questions, however, have less obvious response categories. The procedure for coding these questions is described below and summarized in **Exhibit 3-1** (corresponding to Exhibits 2-3 and 2-4 in *Guide* 1997).

Questions Q2 to Q7 have three response categories: “often true,” “sometimes true,” and “never true.”<sup>20</sup> For these questions both “often” and “sometimes” are considered affirmative responses because they indicate that the condition occurred at some time during the year. The distinction between the “often” and “sometimes” response is not used in the scale.<sup>21</sup>

Q8a, Q12a, and Q14a are follow-up questions whose response categories are “almost every month,” “some months but not every month,” and “only one or two months.” For purposes of the scale, the first two responses are considered affirmative and the third is considered negative. Thus, the negative condition on these indicators is “only one or two months” while the positive, or affirmative, is that the condition occurred in three months or more during the year.

Several general rules apply:

- Questions that a household does not answer *because it has been screened out* are coded as *negative* responses. The household was screened out precisely because it was deemed, on the basis of earlier information, *not* to have experienced the conditions represented in those questions.

**Exhibit 3-1**

**CODING SURVEY RESPONSES FOR THE FOOD SECURITY SCALE**

<b>Question Number</b>	<b>Question</b>	<b>Negative Responses (Code = 0)</b>	<b>Affirmative Responses (Code = 1)</b>	<b>Missing Data (Code = .)</b>
Q2	Worried food would run out	Never true ( <i>or screened out at prelim. screen</i> )	Often true; Sometimes true	Refused; Don't know
Q3	Food bought just didn't last	Never true ( <i>or screened out at prelim. screen</i> )	Often true; Sometimes true	Refused; Don't know
Q4	Couldn't afford to eat balanced meals	Never true ( <i>or screened out at preliminary screen</i> )	Often true; Sometimes true	Refused; Don't know
Q5	Few kinds of low-cost food for children	Never true ( <i>or screened out at preliminary screen</i> )	Often true; Sometimes true	Refused; Don't know (or No children)
Q6	Couldn't feed children a balanced meal	Never true ( <i>or screened out at preliminary screen</i> )	Often true; Sometimes true	Refused; Don't know (or No children)
Q7	Children were not eating enough	Never true ( <i>or screened out at preliminary or 1st-level screen</i> )	Often true; Sometimes true	Refused; Don't know (or No children)
Q8	Adult(s) cut or skipped meals	No ( <i>or screened out at preliminary or 1st-level screen</i> )	Yes	Refused; Don't know
Q8a	Adult(s) cut or skipped meals, 3+ months	Only 1 or 2 months; Skipped ("no" on 8) ( <i>or screened out at prelim. or 1st-level screen</i> )	Almost every month; Some months but not every month	Refused; Don't know
Q9	You ate less than felt you should	No ( <i>or screened out at preliminary or 1st-level screen</i> )	Yes	Refused; Don't know
Q10	You were hungry but didn't eat	No ( <i>or screened out at preliminary or 1st-level screen</i> )	Yes	Refused; Don't know
Q11	You lost weight because not enough food	No ( <i>or screened out at preliminary or 1st-level screen</i> )	Yes	Refused; Don't know

Note: Include *options in italics* in coding criteria if screens are used; otherwise, disregard.

Exhibit 3-1 (continued)

Question Number	Question	Negative Responses (Code = 0)	Affirmative Responses (Code = 1)	Missing Data (Code = .)
Q12	Adult(s) not eat for whole day	No ( <i>or Screened out at Preliminary, 1st-, or 2nd-level screen</i> )	Yes	Refused; Don't know
Q12a	Adult(s) not eat for whole day, 3+ months	Only 1 or 2 months; Skipped (“no” on 12); ( <i>or Screened out at Preliminary, 1st-, or 2nd-level screen</i> )	Almost every month; Some months but not every month	Refused; Don't know
Q13	Cut size of children’s meals	No ( <i>or Screened out at Preliminary, 1st-, or 2nd-level screen</i> )	Yes	Refused; Don't know (or No children)
Q14	Children ever skip meals	No ( <i>or Screened out at Preliminary, 1st-, or 2nd-level screen</i> )	Yes	Refused; Don't know (or No children)
Q14a	Children skip meals, 3+ months	Only 1 or 2 months; Skipped (“no” on 14); ( <i>or Screened out at Preliminary, 1st-, or 2nd-level screen</i> )	Almost every month; Some months but not every month	Refused; Don't know (or No children)
Q15	Children ever hungry	No ( <i>or Screened out at Preliminary, 1st-, or 2nd-level screen</i> )	Yes	Refused; Don't know (or No children)
Q16	Children not eat for whole day	No ( <i>or Screened out at Preliminary, 1st-, or 2nd-level screen</i> )	Yes	Refused; Don't know (or No children)

Note: Include *options in italics* in coding criteria if screens are used; otherwise, disregard..

- Similarly, a follow-up question ("How often did this happen?"), with built-in skip pattern, that a household does not answer ***because the questionnaire skips it over the item*** is coded as a ***negative*** response. Here again, the household is skipped on the item because, based on earlier information, it may be deemed ***not*** to have experienced the condition represented in the question.
- However, for households without children that are automatically skipped over child items, ***the missing child-item responses are coded as "missing" rather than negative.*** This treatment is required to construct a common scale applicable to both types of household--those with and without children--through maintaining comparability in the

scale's severity-level values for the indicators that are common to both groups (i.e., the adult items).

- Any other question that a household fails to answer, for any reason other than being screened out or skipped over, is coded as “*missing*” (i.e., item nonresponse). This includes all responses with codes such as “don’t know” or “refused to answer.”

### **Assigning Scale Values to Households with Complete Responses and Classifying Households by Food Security Status Level**

Two measures of households’ food security can be computed from the core module data. Both of these measures capture the underlying phenomenon of food insecurity/hunger throughout the several identifiable levels or ranges of severity as these are experienced and reported by U.S. households. Each measure locates the position of the household with respect to the ordered series of indicator items comprising the core module, based on the household's overall pattern of response to the complete set of indicators. This section describes the two measures and specifies how to calculate each measure from the core-module data.

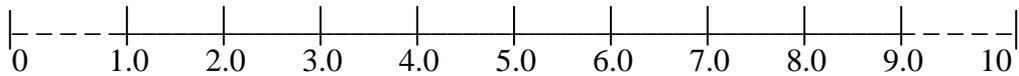
The relationship between the two forms of the food security measure, and the respective ways in which they represent the underlying phenomenon being measured, are illustrated in **Exhibit 3-2**. (See also the bullets pp.11-12 above.) The phenomenon itself may be thought of as a *continuum* of increasingly severe conditions and experiences, and of the household's behavioral responses to these. The level of food security for each household can be visualized as falling at some point on this continuum, which extends from fully secure at one limit to a severe level of food insecurity, with experiences of hunger due to lack of resources to obtain food for both adults and children, at the other.

In principle, the continuous food-security *scale* measure is the more fundamental of the two forms. Since the scale actually measures the severity of food *insecurity*, the condition of fully secure, which represents the *absence* of the measured condition, is assigned a scale value of zero. The most severe condition, represented by presence of all the available indicators, is assigned a scale value approaching ten. Thus, the full range of the continuum captured by the measure is indicated by scale scores ranging from zero to ten. The unit of measure used is largely a matter of convenience, so the 0-10 metric has been adopted for the standard U.S. food security scale due to its simplicity and familiarity. (The section "Scale Metrics" in Appendix C describes alternative units of measure used in U.S. food

Exhibit 3-2

**TWO MEASURES OF SEVERITY  
OF HOUSEHOLD FOOD INSECURITY AND HUNGER**

Conditions/Experiences/Behaviors Indicative of Food Insecurity and Hunger: (sequential set of increasingly severe indicators)				
No such indications: <i>Presumed food secure</i>	One or two indications: <i>At-risk</i>	Multiple indications: <i>Few or no hunger indicators</i>	More, and more severe, indications: <i>Multiple indicators of adult hunger</i>	Many indications, including: <i>Child hunger indicators and more severe adult hunger indicators</i>



**Household Food Security Scale -- continuous measure**

	(2.32) <sup>*/</sup>	(4.56) <sup>*/</sup>	(6.53) <sup>*/</sup>
Food Secure	Food Insecure:		
	Food Insecure Without Hunger	Food Insecure With Hunger:	
		(less severe) "Moderate"	(more severe) "Severe"

**Household Food Security Status -- categorical measure**

<sup>\*/</sup> Located at midpoint between the two adjacent household scale values.

security reports and data products and the relationships among them. See also Technical Note 2 in Appendix D.) The continuous measure is appropriate for research models that employ correlation, regression, or analysis of variance methods, since it includes more information than the categorical measure--the maximum information and highest level of precision that can be supported by the core-module data.

The food security status-level measure reflects meaningful *ranges of severity* that are *defined on* the underlying scale. The categorical form of the measure is appropriate for comparing prevalences of food insecurity and hunger across subpopulations or regions, and is often the more convenient form for reporting food security monitoring data and for preliminary or exploratory research into the nature, causes, and consequences of food insecurity and hunger. It also is more readily understandable in that it captures the most important thresholds of experience and behavior that appear in the underlying continuous phenomenon--the transitions for the household from "food secure" to "food insecure" and from "food insecure without hunger" to "food insecure with hunger."

With the households' responses to the survey questions coded as described in the previous section, the next step is to determine if the data, as coded, are complete for all households or if they include missing values for any relevant items. If there are missing values, the choice must be made either to utilize one of several direct imputation methods to replace missing values with imputed affirmative or negative responses, or to employ Rasch model software to calculate household scale values. Direct imputation methods are simpler, and in most cases are quite adequate for the small proportion of missing values typically found in core-module data. Using Rasch methods has the added benefit of applying a sophisticated statistical imputation formula for the missing data, but requires special software as well as considerable statistical background and programming experience. If it is decided to fill missing values by using one of the direct methods, the necessary next step is to complete that procedure. A simple direct imputation method appropriate to the food security data is presented in the following section. If instead, software for implementing Rasch measurement is to be used, this must be applied to the pre-imputation data set, as explained in Appendix C.

In practice, the process of measuring the food security of each household, in either or both of the two forms of the measure, is quite straightforward for households with complete responses to all relevant items--i.e., households that have answered all applicable questions or, in

the event of missing or non-responsive answers ("don't know" or "refused"), have had answers imputed for the missing items. The scale contains 18 items for households with children and 10 items for households without children, so a complete response requires either 18 or 10 valid answers. The next step is to count the number of affirmative responses for each household. Remember that the child items are coded as "missing" for households without children and that in this one case values are *not* imputed for these items; they simply are not applicable for the households without children. It also should be remembered that when items are skipped because of prior responses—i.e., because the household already has been screened out, or because a negative answer to a base question makes it unnecessary to ask a followup—these are coded as *negative* responses, not missing items, and are counted as valid responses.

Once the data have been assured to be complete for all households and the number of affirmative responses has been calculated, the food security measure for each household can be determined in *either* of its two forms as the next step in the procedure. The food security scale values and status-level classifications are both determined by reference to a table of the standard values estimated for the U.S. population from the CPS food security data, as presented in **Exhibit 3-3**. Both the scale value and the status-level classification of each survey household depend on (1) the number of affirmative answers the respondent has given and (2) whether the household has children—i.e., members less than 18 years old.<sup>22</sup> To determine the scale value and classification for a household, select the column corresponding to the household type (with or without children) in Exhibit 3-3 and select the row corresponding to the total number of affirmative answers by the household. For example, if a household with children gives six out of eighteen affirmative answers, that household is assigned a scale value of 3.9 and classified as *food insecure without hunger*. If, however, a household without children gives six affirmative answers, out of the 10 possible total answers in this case, it is assigned a scale value of 5.0 and classified as *food insecure with hunger (moderate)*.

Exhibit 3-3

**HOUSEHOLDS WITH COMPLETE RESPONSES:  
FOOD SECURITY SCALE VALUES AND STATUS LEVELS  
CORRESPONDING TO NUMBER OF AFFIRMATIVE RESPONSES**

Number of Affirmative Responses:		1998 Food Security Scale Values <sup>a</sup>	Food Security Status Level	
(Out of 18) Households With Children	(Out of 10) Households Without Children		Code	Category
0	0	0.0	0	Food Secure
1		1.0		
	1	1.2		
2		1.8		
	2	2.2		
3		2.4	1	Food Insecure Without Hunger
4		3.0		
	3	3.0		
5		3.4		
	4	3.7		
6		3.9		
7		4.3		
	5	4.4		
8		4.7	2	Food Insecure With Hunger, Moderate
	6	5.0		
9		5.1		
10		5.5		
	7	5.7		
11		5.9		
12		6.3		
	8	6.4		
13		6.6	3	Food Insecure With Hunger, Severe
14		7.0		
	9	7.2		
15		7.4		
	10	7.9		
16		8.0		
17		8.7		
18		9.3		

<sup>a</sup> See Appendix D, technical note 2, for comparison of 1995 and 1998 scale values.

Source: Calculated by ERS from August 1998 Current Population Survey Food Security Supplement data.

## **Imputing Missing Values for Households with Incomplete Responses**

Some survey respondents may fail to answer one or more applicable questions in the food security module. In principle, the treatment of households with missing answers is complex because the household's scale value depends on its overall pattern of response to the core-module questions, so *which* questions were and were not answered is important. The mathematical scaling method used in developing the U.S. food security scale (the Rasch measurement model) makes it possible to assign appropriate values to households that have missing responses for one or more items. This can be done either through the computationally intensive approach of fitting the Rasch model directly to your survey data, using the Bigsteps software program or another similar program, or it can be done through one of several direct imputation methods.

The original *Guide to Implementing the Core Food Security Module* (1997) presented lengthy tables for assigning scale scores to households with up to three missing responses, based on the Rasch-derived scale values for U.S. households. For households with more than three missing items, the *Guide* provided a computational algorithm for closely approximating their Rasch values. Finally, for researchers wanting to apply the Rasch measurement model directly to their own data, the *Guide* offered advice on implementing the Bigsteps software program (Appendix D in the 1997 *Guide*; cf. Appendix C below).

The original guidance on how to score households which responded to some, but not all, scale questions was based on assumptions about the probable character of missing data derived from item response theory, mostly from experience in educational testing. Further examination of those assumptions and of the actual patterns of missing items in the CPS Food Security Supplements has led the federal Food Security Measurement Project to adopt a simpler, methodologically conservative set of procedures which we believe is appropriate for the food security data. The following information supersedes pages 22 and 23 and Appendices B and C in the 1997 *Guide*.

Experience to date with the food security core module is that item nonresponse is very rare. If a respondent agrees to begin the module, he or she generally gives valid responses to all questions asked. Only about one-half of one percent of respondents to the CPS Food Security Supplement either refuse to answer or respond "don't know" to any question in the module. Several smaller surveys using the core module have reported zero levels of item nonresponse.

The newly recommended method imputes responses for missing items based on the nature of the answers--negative or affirmative--that the same household has given to all the other scale items. Following imputation, these households are then scored using the same methods used for households with complete responses.

This imputation procedure is based on the ordered character of the items in the food security core module as observed for the U.S. population and, with only very slight variation, for all major U.S. population subgroups. That is, while the food-insecurity/hunger indicator items vary in severity across a wide range, and households vary widely in the items that they affirm, the severity *ordering* of items tends to be stable across households. As a result, a household that affirms an item will, in general, have affirmed all less severe items and a household that denies an item will, in general, deny all more severe items. This common ordering is not universal, but it is consistent enough to provide a defensible basis for imputing the relatively rare item-nonresponse typically encountered in applications of the module. The imputation procedure is as follows:

- (1) Items are imputed for the purpose of scoring and classifying households based on the standard U.S. food security scale. If you plan to make an independent fit of the Rasch model to your data, or to submit your data to USDA for Rasch scaling, to test how closely the response structure in your sample corresponds to that in the CPS national sample, or other samples, use the pre-imputation data.
- (2) Responses to items that are specifically referenced to children are not imputed for households without children. Child items should remain coded as "missing" for households without children and not be imputed as either yes or no. (The two kinds of households have different scoring values--see Exhibit 3-3.)
- (3) Preparatory to imputation, order the 18 items by severity. Note that item order in the core module questionnaire corresponds approximately to item-severity order, but it does deviate somewhat to improve the interview flow. The following item-severity order is suggested, corresponding to the severity order observed for the U.S. population, based on the item-calibration values from the 1998 CPS Food Security Supplement:

- Q2 - Worried food would run out
- Q3 - Food bought just didn't last
- Q5 - Relied on few kinds of low-cost food for children
- Q4 - Couldn't afford to eat balanced meals
- Q6 - Couldn't feed the children a balanced meal
- Q8 - Adult cut size of meals or skipped meals
- Q9 - Adult ate less than felt they should

- Q8a - Adult cut size of meals or skipped meals in 3 or more months
- Q7 - Children were not eating enough
- Q10 - Adult hungry but didn't eat
- Q11 - Respondent lost weight
- Q13 - Cut size of children's meals
- Q12 - Adult did not eat for whole day
- Q15 - Children were hungry
- Q12a - Adult did not eat for whole day in 3 or more months
- Q14 - Children skipped meals
- Q14a - Children skipped meals in 3 or more months
- Q16 - Children did not eat for whole day

This order differs very slightly from that based on the original 1995 data and food security scaling research (Hamilton et al., 1997a; 1997b). This is probably due to the 1998 redesign of the CPS Supplement, which reordered question sequence and applied the two internal screeners. Note that the form of the CPS Supplement and Core Module questionnaire is now identical, beginning in 1998, and that this form is expected to remain standard for at least several years. Thus, data from current or future surveys using the Core Module are more likely to be consistent with the item-severity order observed in the 1998 CPS Supplement data than in the 1995 data.

Alternatively, item-severity order can be determined from your own survey results. (The variation in item severity-ordering observed across population subgroups in the U.S. is very slight.) For households with children and complete data (i.e., with 18 responses), calculate the proportion of households that affirmed each item. Items affirmed by higher proportions of households are less severe.

- (4) Impute “yes” to a missing item if, for that household, there is a valid affirmative response to at least one item more severe than the missing item **and** no negative response to any item less severe than the missing item.
- (5) Impute all other missing items as “no.” (Note that this procedure is methodologically conservative, tending to minimize false positives.)

Examples (y = yes, n = no, x =missing):

- yy **xx** y nnnnnnnnnnnnnn     Impute the missing responses as “yes.” There is a more severe “yes” response and no less severe “no” response.
- yyyy **x** nnnnnnnnnnnnnn     Impute the missing response as “no.” There is no more severe “yes” response.
- yyyyy **n** **x** y nnnnnnnnnnnn     Impute the missing response as “no.” There is a more severe “yes,” but there is also a less severe “no” response.

yyyyyyy x yy x n x y x nnn      Impute the first two missing responses as "yes" and the second two missing responses as "no," based on the combined application of the above two rules.

- (6) Determine if cases with very few valid responses have enough information to be imputable, or if the entire case should be declared missing (i.e., unscalable--food security status unknown). There are no hard and fast rules for this. It depends somewhat on how good you believe the partial data that you have are. If a household gave no valid responses to any scale item, then it should almost certainly be declared unscalable. Note that a household could refuse all of the first stage questions and then be skipped out of the rest of the questionnaire at the 1st-level screener. For such a household, it is probably not appropriate to score the skipped questions as "no" responses. Rather, those responses also should be assigned as missing and the household classified as unscalable/food security status unknown.

**Keep in touch:**

USDA is interested both in the substantive results you get from your food security data collection and in what your survey can tell us about the measurement methodology. As the guide explains, *for households with complete data* you can implement Rasch measurement to calculate household scale scores and assign food security status categories from the items, by a simple additive process and reference to a table of standard U.S. values, without using computationally intensive Rasch modelling software. With the imputation procedure suggested here, or other method of direct imputation, this capability extends to households with missing items. However, we would like to see how the items behave in your survey as compared with the CPS national population sample. So, as workload permits, ERS is prepared to run your data through the Rasch modelling software, upon request, to test how consistently they scale compared with the CPS-based national scale. This will provide you with additional information for your survey data as well, such as standard Rasch-model fit statistics, so we hope you will be interested. Please feel free to call or email if we can provide any help.

## **Chapter Four**

### **PRELIMINARY GUIDANCE ON SAMPLING LOCAL POPULATION GROUPS FOR FOOD SECURITY SURVEYS**

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In planning food security studies that will collect survey data to quantify the extent of food insecurity and hunger within a local population group, three essential questions should be addressed. Study planners must decide *exactly what the population is* that is going to be surveyed and *why these data are being collected*--i.e., what are the *purposes intended* to be served by measuring the severity of food insecurity and hunger *within that particular group*. These may seem obvious points, but passing over them too hastily at the planning stage can negate a lot of hard work later on, in carrying out the survey only to discover that its results were more limited than intended. The third question is the crux of any survey design: *how will a representative sample be identified* of the population group chosen for the survey?

Defining clearly the target population group is closely related to the question of the purposes the survey findings are intended to serve. Often, a particular research design will define the survey group quite specifically, as dictated by the objectives of the research--e.g., legal immigrants in a given county dropped from Food Stamp eligibility by legislation; current and former SSI recipients with drug- and/or alcohol-related disabilities within a treatment program or catchment area; low-income children served by selected community pediatric clinics; and the general client group for particular community service providers--these are some examples of narrowly defined population segments in several recent food security research designs. Measuring the severity of food insecurity for specific, well defined groups of this kind can accommodate research objectives that include better understanding of the causes and consequences of food deprivation for the particular group studied.

By contrast, the most broadly defined, comprehensive local population group that can be targeted for a food security survey is the community as a whole. Here, the main objectives are likely to include community needs assessment; identifying the particular areas or groups within the community that are experiencing greatest need; gaining information on the characteristics and circumstances of those who are most in need; comparative assessment of the community's condition in relation to other similar places, to the state, and nation; and monitoring changes in the food security status of the community

over time. All these potential uses of food security survey findings can be served effectively when the survey is based on a well designed representative population sample of the community.

In particular, if one purpose of the planned study is to obtain estimates of food insecurity and hunger prevalence within the local population that are directly comparable to state- and national-level population benchmark figures, then a random sample of the local population must be identified for the survey. There are many practical ways to draw a valid representative population sample, but some experienced guidance is needed to assure that the survey design meets essential validity criteria. The present brief notes are not able to provide the kind of detailed and specific guidance required, so we reiterate the recommendation to any local group planning a food security survey to work cooperatively with university or other resource persons experienced in sample-survey design.

Sample surveys also may be designed for rather broad population subgroups within the community, such as low-income families with young children, elderly persons living alone, particular ethnic groups, or the lower-income members of the community as a whole. When such intermediate population groups are explicitly defined and a representative sample is drawn within the target group, a food security survey of that particular group also can produce valid prevalence estimates that will be comparable to figures for the same group in the national benchmark data.

Gaining good data for the lower-income portion of the community, which is the primary focus of concern for most food security issues, in the context of a full population survey often can be done efficiently through a *two-stage* or *stratified sampling* design. Such designs may first identify geographic areas of the community where poverty conditions appear most prevalent, usually based on Census data, then sample proportionately much more heavily within the relatively poor areas than in the less-poor, predictably more food secure sections of the community. Appropriate weighting of the resultant data will then yield valid estimates for the community as a whole, as well as more precise estimates for the lower-income segment of the community.

It may be noted that the core module has been designed to facilitate the efficient screening out of food-secure households, which predictably will represent a large majority of respondents in a full population sample of almost any community in the U.S. today, although stratified sampling will reduce that proportion substantially. When such households include only adults, they will be asked only 3 or 4 food-security questions before being identified as food secure and screened out of the rest of the

module. (The number is four if the optional non-scale USDA food sufficiency question (Q1) is included and three if it is omitted.) Food-secure households that include children will be asked 5 or 6 questions before being screened out. In either case, survey burden due to the core module is light.

One further familiar type of local food-security study sample also should be noted. This is the "convenience sample" drawn from a population subgroup identified solely by virtue of being clients of emergency food providers--e.g., food pantries or charitable meals programs. An evidently needy population segment identified in this way will almost certainly have above-average food-security problems, and a sample survey within the group predictably will find above-average prevalence of food insecurity and hunger. However, such findings have a limited meaning due to the essentially self-selected nature and indeterminate, often fluid, boundaries of the group. If a random sample of persons from a population group identified in this way is surveyed, then the results may be interpreted validly to represent the condition *of that group*, but *only* that group. Note that such findings cannot validly be generalized to any larger group, not even to the group of all low-income members of the same community.

Such findings may nevertheless be valuable, in part simply for documenting in a formal and authoritative way the existence of food insecurity/hunger within an evidently needy segment of the community. It should be kept in mind, however, that the magnitude of such figures has limited meaning and that this may limit their role in policy discussion. By contrast, when food- security estimates are developed from a representative population sample within the community, whether drawn from the entire community or from a well-defined population subgroup, they carry an important added dimension of meaning. Such figures can validly be presented as accurately representing the food security status of the community, or of the population subgroup of concern that has been surveyed, and this may be expected to enhance considerably their relevance and impact for community policy discussion and planning.

## NOTES

### Introduction

- <sup>1</sup> *Report of the President's Task Force on Food Assistance*, January 1984, Introduction, p. 2.
- <sup>2</sup> *Report*, Chapter 5, "How Much Hunger Is There in America?" pp. 37, 39.
- <sup>3</sup> See, for example, "Core Indicators of Nutritional State for Difficult-to-Sample Populations," a report of the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology, S.A. Anderson, ed., published in the *Journal of Nutrition*, v.120, no.11S (November 1990); and USDA, Food and Nutrition Service, jointly with DHHS, National Center for Health Statistics: *Conference on Food Security Measurement and Research: Papers and Proceedings, January 21-22, 1994*. FNS, 1995, Alexandria, VA.
- <sup>4</sup> U.S. Department of Health and Human Services and Department of Agriculture. Ten-Year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program. Federal Register 1993; 58:32 752-806.
- <sup>5</sup> The conceptual basis of the food security measure may be found in the 1990 LSRO report referenced above. However, it is rather hidden from view in that location, because so many other disparate elements of the broad concept of food security are treated there as well. The key central element was extracted from the other, incommensurable components of the broad conceptual definition in order to create an operational form capable of supporting actual measurement of the severity of food insecurity, as directly experienced, which in turn is essential to any estimate of prevalence. Other elements of the broad definition--nutritional quality of diets, safety of food, "socially acceptable" sources of food (however defined)--are of interest to all sectors of the population and are not, intrinsically, indicators of material deprivation as such.
- <sup>6</sup> The state-level prevalence estimates of food insecurity and hunger reported from the CPS national data are based on state-level samples of approximately 500-1500 households. Given these sample sizes, the estimates may be considered reliable for the state's population as a whole, but, for most states, only by means of merging several years' data to increase sample size and, in any case, not for the major demographic or geographic breakdowns within the state population. Thus, state-level estimates of food-insecurity/hunger prevalence that are detailed and reliable for population subgroups within the state depend on sample surveys carried out within the particular state.

### Chapter 1

- <sup>7</sup> The principal food-security scale developed from the CPS data uses the 12-month reference period. This period was chosen to avoid potential seasonal effects, to better correspond with poverty-income and other established data series, and to produce a more stable measure than one reflecting very short-run changes. The CPS data also include a 30-day reference period for the more severe range of food-insecurity/hunger indicators. For research designs involving other time periods, the food-security Core Module may be adapted accordingly (cf. p. 25 above).

- <sup>8</sup> Statistics based on the categorical food security measure have been adopted for administrative uses in several settings. These include:
- performance indicators for the Food and Nutrition Service (overall impact of federal nutrition-assistance programs) under the 1993 Government Performance and Results Act (GPRA);
  - monitoring indicators for the U.S. Department of Agriculture under the *U.S. Domestic Plan of Action* developed in response to the 1996 International Food Summit *Declaration of Rome*;
  - target and monitoring indicators of the health and nutritional status of the U.S. population in the *Healthy People 2010* federal inter-agency public health planning document;
  - national monitoring indicators of children's well-being for the Federal Interagency Forum on Child and Family Statistics; and
  - indicators of welfare reform outcomes for the U.S. Department of Health and Human Services.
- <sup>9</sup> The 1984 Report of the President's Task Force on Food Assistance noted: *...we find that the terms 'hunger,' 'poverty,' and 'unemployment' are often used interchangeably...Yet we believe it extremely important to bear in mind that these are not the same phenomena. ...defining hunger, poverty and unemployment as a single problem is not only unwarranted by the facts, it also makes potential solutions more difficult to identify.* (p.3).
- <sup>10</sup> See the bibliographies of this research literature in Andrews, et al. 1998, Bickel, et al. 1998, Carlson, et al. 1999, Frongillo 1999, Hamelin, et al. 1999, Olson 1999, and Rose 1999 (listed in References).
- <sup>11</sup> The CPS Food Security Supplement does collect information on major types of food-augmenting coping behaviors, e.g., getting emergency food from a food pantry, eating meals at a soup kitchen, borrowing money to buy food, and others. These coping-behavior items were tested for inclusion in the food security scale. However, they were found not to meet the statistical test criteria for inclusion *within* the measurement scale, even though they correlate closely *with* the scale. Very few households use these coping behaviors that are not also identified as food insecure by the scaled measure. Other aspects of the broad conceptual definition (LSRO 1990) are not readily, if at all, commensurable with the central element measured by the food security scale (see note 5).
- <sup>12</sup> For technical reasons, a somewhat larger range is preferable for computational purposes, so a unit of measure is used in the electronic data files of the Food Security Supplement maintained by the Census Bureau such that the range of values encompassed by the standard scale is 0-14. (A simple linear transformation converts one to the other.) See the section "Scale Metrics" in Appendix C for a full discussion of this topic.
- <sup>13</sup> Documentation provided by USDA and U.S. Census Bureau for Office of Management and Budget review and clearance of the Food Security Supplement to the Current Population Survey.
- <sup>14</sup> Rose and Oliveira, 1997a and 1997b, find strong correlations (most at the 0.99 level of significance) between a self-reported measure of household food sufficiency related to the food-security-scale measure and standard nutritional adequacy measures for 13 of 14 critical nutrients, plus food energy, examined from the 1989-91 USDA Continuing Survey of Food Intakes by Individuals.
- <sup>15</sup> Data from the food security core module will be collected in NHANES-4 and CSFII both at the household level and, for the scale's hunger-indicator items, at the individual level for sampled persons, both adults and children, in the household. This will enable more precise identification and measurement of hunger among specific household members.

- <sup>16</sup> The CPS data allow comparisons between households with single or multiple adults, and between those with single or multiple children. Response patterns are very similar between the single-person and multi-person groups of households.

## Chapter 2

- <sup>17</sup> Follow-up questions in the 30-day time frame are asked only for the more severe range of indicator items. The somewhat truncated 30-day scale based on these data is reported in Hamilton, et al., 1997a.
- <sup>18</sup> Blumberg, et al., 1999.
- <sup>19</sup> The two stages of internal screening designed into the core module and adopted for use with the CPS Food Security Supplement beginning in 1998 *require a definite affirmative response on at least one* of the preceding-stage food security questions. Thus, if one or more answers is non-responsive ("refused" or "don't know") but at least one other answer is affirmative, the household is passed through the screen. However, if one or more answers is non-responsive to any of the preceding-stage questions, *and all other answers at that stage are negative*, the household is screened out--i.e., the non-responsive answers are treated as effectively negative in this case. However, in the *preliminary* screener used for higher-income households in the CPS Supplement, the slightly more open form of screen is used in which "don't know" and "refused" responses cause the household to be *passed through* the screen--i.e., in this case, the non-responsive answers are treated as *potentially affirmative*. This serves to minimize potential information loss due to the screen, perhaps at the price of increased irritation for some respondents at being asked additional irrelevant questions. Clearly, whether the "refused" and "don't know" responses cause households to be passed through the screen or screened out is a judgment call for each researcher, weighing the tradeoffs in the particular context of their project between potential information loss vs. potential increased survey burden.

## Chapter 3

- <sup>20</sup> Cognitive assessment of the U.S. standard core module for use with Native American (First Nations) people in northern Alberta, Canada, found that the terminology "often, sometimes, or never true for you" in this setting carried insulting connotations, suggesting interviewer questioning of respondents' truthfulness in the answers given. Consequently, in this application the phrasing of the temporal follow-up questions was changed to: "How often did this happen to you--did it happen often, sometimes, or never?" (Personal communication from Judith Lawn, consulting nutritionist.)
- <sup>21</sup> A requirement of the Rasch model used for the U.S. standard food security scale is that all indicator variables be dichotomous. The 3-way categorical variables in the core module may be dichotomized in alternative ways. Both ways were tried out in the extensive testing leading to the identification of the 18-item indicator set, with the stronger alternative in terms of model fit statistics being selected for the measurement scale.
- <sup>22</sup> The standard data files for the CPS Food Security Supplement code persons below age 18 as adults, rather than children, if they are the household reference person ("head of household") or spouse of the reference person.

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**APPENDIX A**

**The Food Security Core-Module Questionnaire**

**U.S. Household Standard Food-Security/Hunger Survey Module**

**U.S. HOUSEHOLD FOOD-SECURITY/HUNGER SURVEY MODULE:  
3-STAGE DESIGN ( 2 INTERNAL SCREENERS )**

**Questionnaire transition into module--administer to all households:** These next questions are about the food eaten in your household in the last 12 months, since (current month) of last year, and whether you were able to afford the food you need.

**General food sufficiency question/screener: Questions 1, 1a, 1b** (OPTIONAL: These questions are NOT used in calculating the food-security/hunger scale.) Question 1 may be used as a screener: (a) in conjunction with income as a *preliminary* screen to reduce respondent burden for *higher income households only*; and/or (b) in conjunction with the 1st-stage internal screen to make that screen "more open"--i.e., provide another route through it.

1. [IF ONE PERSON IN HOUSEHOLD, USE "I" IN PARENTHETICALS, OTHERWISE, USE "WE."]

Which of these statements best describes the food eaten in your household in the last 12 months: --enough of the kinds of food (I/we) want to eat; --enough, but not always the kinds of food (I/we) want; --sometimes not enough to eat; or, --often not enough to eat?

- [1] Enough of the kinds of food we want to eat [SKIP 1a and 1b]
- [2] Enough but not always the kinds of food we want [SKIP 1a; ask 1b]
- [3] Sometimes not enough to eat [Ask 1a; SKIP 1b]
- [4] Often not enough [Ask 1a; SKIP 1b]
- [ ] DK or Refused (SKIP 1a and 1b)

- 1a. [IF OPTION 3 OR 4 SELECTED, ASK] Here are some reasons why people don't always have enough to eat. For each one, please tell me if that is a reason why YOU don't always have enough to eat. [READ LIST. MARK ALL THAT APPLY.]

- | YES                      | NO                       | DK                       |  |
|--------------------------|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Not enough money for food                          |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Not enough time for shopping or cooking            |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Too hard to get to the store                       |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | On a diet  |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | No working stove available                         |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Not able to cook or eat because of health problems |

- 1b. [IF OPTION 2 SELECTED, ASK] Here are some reasons why people don't always have the quality or variety of food they want. For each one, please tell me if that is a reason why YOU don't always have the kinds of food you want to eat. [READ LIST. MARK ALL THAT APPLY.]

- | YES                      | NO                       | DK                       |   |
|--------------------------|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Not enough money for food               |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Kinds of food (I/we) want not available |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Not enough time for shopping or cooking |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Too hard to get to the store            |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | On a special diet                       |

**BEGIN FOOD-SECURITY CORE MODULE (i.e., SCALE ITEMS)**

**Stage 1: Questions 2-6 --ask all households:**

[IF SINGLE ADULT IN HOUSEHOLD, USE "I," "MY," AND "YOU" IN PARENTHESES; OTHERWISE, USE "WE," "OUR," AND "YOUR HOUSEHOLD;" IF UNKNOWN OR AMBIGUOUS, USE PLURAL FORMS.]

2. Now I'm going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months, that is, since last (name of current month).

The first statement is "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

3. "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

4. "(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

[IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK Q5 - 6; OTHERWISE SKIP TO 1<sup>st</sup>-Level Screen.]

5. "(I/we) relied on only a few kinds of low-cost food to feed (my/our) child/the children) because (I was/we were) running out of money to buy food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

6. "(I/We) couldn't feed (my/our) child/the children) a balanced meal, because (I/we) couldn't afford that." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

**1<sup>st</sup>-level Screen** (screener for Stage 2): If **AFFIRMATIVE RESPONSE** to **ANY ONE** of Questions 2-6 (i.e., "often true" or "sometimes true") OR response [3] or [4] to Question 1 (if administered), then continue to Stage 2; otherwise, skip to end.

**Stage 2: Questions 7-11** --ask households passing the 1<sup>st</sup>-level Screen: (estimated 40% of hh's  $\leq$  185% Poverty; 5.5% of hh's  $>$  185% Poverty; 19% of all households).

[IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK Q7; OTHERWISE SKIP TO Q8]

7. "(My/Our child was/The children were) not eating enough because (I/we) just couldn't afford enough food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or R

8. In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
- No (SKIP 8a)
- DK or R (SKIP 8a)

- 8a. [IF YES ABOVE, ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?

- Almost every month
- Some months but not every month
- Only 1 or 2 months
- DK or R

9. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?
- Yes  
 No  
 DK or R
10. In the last 12 months, were you every hungry but didn't eat because you couldn't afford enough food?
- Yes  
 No  
 DK or R
11. In the last 12 months, did you lose weight because you didn't have enough money for food?
- Yes  
 No  
 DK or R

**2<sup>nd</sup>-level Screen** (screener for Stage 3): **If AFFIRMATIVE RESPONSE to ANY ONE of Questions 7 through 11, then continue to Stage 3; otherwise, skip to end.**

**Stage 3: Questions 12-16** --ask households passing the 2<sup>nd</sup>-level Screen: (estimated 7-8% of hh's < 185% Poverty; 1-1.5% of hh's > 185% Poverty; 3-4% of all hh's).

12. In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?
- Yes  
 No (SKIP 12a)  
 DK or R (SKIP 12a)
- 12a. [IF YES ABOVE, ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?
- Almost every month  
 Some months but not every month  
 Only 1 or 2 months  
 DK or R

[IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK 13-16; OTHERWISE SKIP TO END.]

13. The next questions are about children living in the household who are under 18 years old. In the last 12 months, since (current month) of last year, did you ever cut the size of (your child's/any of the children's) meals because there wasn't enough money for food?

Yes  
 No  
 DK or R

14. In the last 12 months, did (CHILD'S NAME/any of the children) ever skip meals because there wasn't enough money for food?

Yes  
 No (SKIP 14a)  
 DK or R (SKIP 14a)

- 14a. [IF YES ABOVE ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?

Almost every month  
 Some months but not every month  
 Only 1 or 2 months  
 DK or R

15. In the last 12 months, (was your child/ were the children) ever hungry but you just couldn't afford more food?

Yes  
 No  
 DK or R

16. In the last 12 months, did (your child/any of the children) ever not eat for a whole day because there wasn't enough money for food?

Yes  
 No  
 DK or R

---

**END OF FOOD-SECURITY/HUNGER CORE MODULE**

## User Notes

**(1) Response Options:** For interview surveys, DK (“don’t know”) and “Refused” are blind responses--that is, they are not presented as response options, but are marked if volunteered. For self-administered surveys, DK is presented as a response option.

**(2) Internal Screeners:** Two levels of internal screening are provided for survey designers who wish to reduce respondent burden for households not manifesting: (a) *any* level of food insecurity (1st-level screener); or (b) any signs of *hunger* (2nd-level screener). The optional Q1 also may be used in conjunction with the 1st-level screener to provide an additional, independent basis for passing households through the screen (i.e., making the screen somewhat less stringent).

To further reduce burden for higher-income respondents, a preliminary screener may be constructed using Q1 along with a household income measure. Households with income above twice the poverty threshold, AND who respond <1> to Q1 may be skipped to the end of the module and classified as food secure. (This preliminary screen should not be used for lower-income households.) Use of this preliminary screener reduces total burden in a survey with many higher-income households, and the cost, in terms of reduced accuracy in identifying food-insecure households, is slight. Research has shown that a very small proportion of the higher-income households screened out by this procedure will register food insecurity if administered the full module. Consequently, if Q1 is not desired for research purposes, a preferred strategy is to omit Q1 and administer Stage 1 of the module to all households. Administration time for Stage 1 is very nearly the same as administration time for the preliminary USDA food sufficiency question/screener.

**(3) Time Reference Period:** The scale items may be modified from the 12-month reference period to a shorter time period if required for your research design. The CPS food-security database includes 30-day reference periods for the more severe scale items (Q8-Q18) and other surveys have used the core module with reference periods shorter than 12 months. For example, the questionnaire items may be modified from the 12-month period to the 30-day reference period by changing the “last 12-month” reference in each question to “last 30 days.” In this case, items 8a, 12a, and 14a must be changed to read as follows:

8a/12a/14a: [IF YES ABOVE, ASK] In the last 30 days, how many days did this happen?  
\_\_\_\_\_ days  
[ ] DK

**(4) Food-Security/Hunger Scale:** Questions 2-16 provide a complete, validated set of food-insecurity/hunger indicator variables for use in: (1) scaled measurement of the severity of household food insecurity and hunger; (2) classification of households according to designated severity ranges; and (3) comparison of food-insecurity and hunger prevalence with national benchmark data. See Chapter 3 for detailed guidance on coding household responses and calculating household scale scores and status levels.

**APPENDIX B**

**Standard 6-Item Indicator Set for  
Classifying Households by Food Security Status Level**

**STANDARD 6-ITEM INDICATOR SET FOR  
CLASSIFYING HOUSEHOLDS BY FOOD-SECURITY-STATUS LEVEL**

**(Short Form of the 12-month Food Security Scale)**

**BACKGROUND.**

If respondent burden permits, the full 18-item scale is the recommended measure of food security, food insecurity, and hunger. However, for surveys that cannot implement that measure, the standard “short form” six-item scale provides a reasonably reliable substitute. It has been shown to have reasonably high specificity and sensitivity and minimal bias with respect to the 18-item measure (Blumberg, et al., 1999). *It does not, however, measure the more severe levels of food insecurity at which child hunger is generally observed, and cannot, therefore, identify households where child hunger has been experienced and reported.*

It may be noted that this set of six items constitutes the full set of adult items within the *intermediate* range of severity captured by the full scale derived from the core module. This particular set has been shown to be the strongest available 6-item set, across households both with and without children, for achieving the most accurate classification, in relation to the full-scale-based classification of household food security status, *up through this intermediate range of severity*. This intermediate severity range identifies households reporting hunger experiences, but without capturing the further detail that identifies the most severe scale range required to identify children's hunger. For households that reach this level of severity captured by the standard 6-item set, however (i.e., "food insecure with evidence of hunger"), the classification does provide a reliable indicator of *high risk* of children's hunger within the household, in the sense that the probability that children in such households have experienced hunger is much greater than for other children.

**ITEM NUMBERS.** The item numbers used here are the numbers for the same items in the 18-item core module. See Appendix D, Technical Note 1 for the correspondence between this and the numbering used (1) in the April 1995 CPS Food Security Supplement and the reports by Hamilton et al. about that survey, and (2) in the August 1998 and subsequent CPS Food Security Supplements.

**TRANSITION/LEADER.** If the placement of items in your survey makes the transitional or introductory sentence unnecessary, you may add the word “Now” to the beginning of question 1: “Now I’m going to read you....”

**FILL INSTRUCTIONS.** Select the appropriate fill from parenthetical choices depending on the number of persons and number of adults in the household. If this information is unknown, or very few single-adult households are included in your sample, the plural forms may be used throughout.

**USING AN INTERNAL SCREENER.** The 6-item set can be used with an optional internal screener, comparable to the first-level internal screen used in the 18-item core module. Testing has shown that a screen placed after the first three questions in the 6-item sequence causes a negligible misclassification of food-insecure households (false negative classifications). The procedure results in a 0.2 percent reduction in the number of households identified as food insecure without hunger and a zero loss of households identified as food insecure with hunger--i.e., this screen has no effect on the power of the scale to classify households with hunger.

#### **CODING THE DATA FOR SCALING.**

- Items 1 and 2 are scored as affirmative if response is [1] "Often true" or [2] "Sometimes true." They are scored as negative if response is [3] "Never true."
- Items 3, 5, and 6 are scored as affirmative if response is [1] "Yes" and negative if response is [2] "No."
- Item 4 is scored as affirmative if response is [1] "Almost every month" or [2] "Some months but not every month." It is scored as negative if response is [3] "Only 1 or 2 months" or [X] Question not asked because of negative or missing response to question 3.

**MISSING VALUES.** Missing values as the result of item nonresponse ("Don't know" or Refused) may be handled the same way in scoring the standard 6-item data sets as in scoring the full core-module data (Chapter 3, above, "Imputing Missing Values for Households with Incomplete Responses").

**ASSIGNING FOOD SECURITY SCALE SCORES AND CLASSIFYING HOUSEHOLDS BY FOOD SECURITY STATUS.**

Households with complete responses can be assigned scale scores and classified into the appropriate food security status levels (severity ranges) based on the standard values presented in Exhibit B-1. Appendix C provides a discussion of the two standard metrics (units of measure) in which the scale scores are presented.

**Exhibit B-1 -- Table of Standard Values**

Number of affirmatives	Scale Score Standard Computational Metric	Scale Score Standard 0-10 Metric	Food Security Status Level
0	0 <sup>*/</sup>	0 <sup>*/</sup>	Food secure
1	2.86	2.04	Food secure
2	4.19	2.99	Food insecure without hunger
3	5.27	3.77	Food insecure without hunger
4	6.30	4.50	Food insecure without hunger
5	7.54	5.38	Food insecure with hunger
6 (evaluated at 5.5)	8.48	6.06	Food insecure with hunger

<sup>\*/</sup> Note: Households that affirm no items are deemed to be food secure and are assigned a scale score of zero. However, this has an arbitrary element, as the interval from 0 to 2.86 (or 0-2.04) is undefined. How much the food security level of these households differs from households that affirmed one item is not measured by the Rasch method. Chapter 3 and Appendix C provide fuller discussion of this issue.

**Note:** The material in this Appendix was prepared by Mark Nord and Margaret Andrews (Economic Research Service) in consultation with Gary Bickel (Food and Nutrition Service), based on research by Stephen J. Blumberg and Karil Bialostosky (National Center for Health Statistics), William L. Hamilton (Abt Associates, Inc.), and Ronette R. Briefel (then at NCHS, now at Mathematica Policy Research, Inc.).

**6-Item Subset (Short Form) of the 12-month Food Security Scale – Questionnaire**

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[LEAD] These next questions are about the food eaten in your household in the last 12 months and whether you were able to afford the food you need.

Q3 I'm going to read you two statements that people have made about their food situation. Please tell me whether the statement was **OFTEN**, **SOMETIMES**, or **NEVER** true for (you/you and the other members of your household) in the last 12 months.

The first statement is, "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- [ 1 ] Often true
- [ 2 ] Sometimes true
- [ 3 ] Never true
- [ Don't know, Refused ]

---

Q4 "(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- [ 1 ] Often true
- [ 2 ] Sometimes true
- [ 3 ] Never true
- [ DK, R ]

---

Q8 In the last 12 months, since (date 12 months ago) did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

- [ 1 ] Yes
- [ 2 ] No (GO TO 5)
- [ DK, R ] (GO TO 5)

---

**Optional Screener:** If any of the first 3 questions are answered affirmatively (i.e., if either Q2 or Q3 are "often true" or "sometimes true" or Q8 is "yes"), proceed to the next question. Otherwise, skip to end.

---

Q8a [Ask only if Q8 = YES] How often did this happen --almost every month, some months but not every month, or in only 1 or 2 months?

- [ 1 ] Almost every month
- [ 2 ] Some months but not every month
- [ 3 ] Only 1 or 2 months
- [ DK, R ] [or X (i.e., Question not asked because of negative or missing response to Q8).]

---

Q9 In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?

- [ 1 ] Yes
- [ 2 ] No
- [ DK, R ]

---

Q10 In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?

- [ 1 ] Yes
- [ 2 ] No
- [ DK, R ]

---

**END**

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**APPENDIX C**

**Using Rasch Software to: (1) Scale Households  
with Missing Items; (2) Assess Data Quality; and  
(3) Assess Validity of the National Scale  
for Special Population Groups**

## **Using Rasch Software to Assess Data or to Assign Household Scale Scores**

Mark Nord, Economic Research Service

The statistical methods that underlie the food security scale are quite powerful and sophisticated. However, implementing the measure is very straightforward and does not require knowledge or use of those statistical methods or software to implement them. As described in Chapter 3, assigning food security scale scores and status categories is, in most applications, as simple as counting up affirmative answers and reading the appropriate scale values from a standard table. There are applications, however, in which the user may want or need to use Rasch scaling methods. The two most common reasons are:

1. To assess the data. Comparing item calibrations calculated from data collected in a survey with item calibrations calculated from the national CPS Food Security Supplement provides important information about the surveyed population and about survey administration. Similar item calibrations, and especially similar item severity order, indicate that the population surveyed manages and describes food deprivation in ways similar to the national population. This validates use of the standard methodology for assigning scale scores and validates comparison of prevalence rates based on the survey to national prevalence rates based on the CPS Food Security Supplements. The food security scale has proven very robust over a wide variety of special populations, but unique cultural or behavioral characteristics of some populations could invalidate the standard method and require special treatment. Problems in survey administration such as incorrect question wording, inappropriate skip patterns, systematic miscoding, or misreading by interviewers, may be indicated by a single discrepant item or set of items with calibrations of the remaining items near the national standard.
2. To handle missing items. Recommended methods for imputing occasional missing items are detailed in chapter 3. Some users may prefer to use Rasch methods to score households with missing items. A special case can arise if one item is invalidated for all, or a substantial share, of households because of a survey administration problem. In such cases it may not be appropriate to impute the item, and Rasch methods must be used.

This appendix provides the researcher with basic information needed to link the national benchmark methods to other survey data using Rasch methods. It is assumed that the researcher is familiar with the Rasch model, has access to software to implement the Rasch model, and knows how to use the software. Most users unfamiliar with such software will require a short course or some self-study time to be able to apply it to survey data. The concepts are somewhat complex and the software is not intuitively accessible or user-friendly.

## **Software**

The two most easily implemented Rasch modeling software packages are Bigsteps (and its recent successor Winsteps)<sup>1</sup> and Bilog.<sup>2</sup> All these packages use iterative maximum likelihood methods to calculate item calibrations and household scores, but they offer different sets of item characteristic statistics and fit statistics. Bigsteps may be somewhat simpler and more straightforward to implement, but it does not adjust for varying case weights. Bigsteps was used in the initial development of the food security scale based on the 1995 data. Bilog has been used in the Federal project in more recent years in order to incorporate case weights in the calculation of item calibrations. Applied to unweighted data, the two packages produce the same item calibrations and household scores. If model assumptions are met, use of case weights (and, indeed, random sampling) are not required for consistent estimates of item calibrations, and in practice, calibrations based on weighted and unweighted data are essentially identical.

## **Rasch Basics**

The Rasch measurement model, which was developed primarily in the educational testing field, assumes an underlying continuum--in the present case, of the severity of food insecurity experienced by the household--upon which both items and households can be located, and assumes that the probability of a household affirming a specific item depends on the relative severity of the household and the item. The single-parameter Rasch model, which is used to create the food security scale, assumes specifically that the log of the odds of a household affirming an item is proportional to the difference between the severity level of the household and the severity level of the item. Thus, the probability that a household at severity-level  $h$  will affirm an item at severity-level  $i$  is:

$$p_{h,i} = e^{(h-i)} / (1 + e^{(h-i)})$$

where  $e$  is the base of the natural logarithms.

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<sup>1</sup> BIGSTEPS Rasch-Model Computer Program, MESA Press, 5835 Kimbark Ave., Chicago IL 60637-1609. The general web address is: <MESA@uchicago.edu> and for Rasch software and books: <www.winsteps.com>. BIGSTEPS, the DOS-based pre-WINSTEPS Rasch measurement program from MESA Institute, can be downloaded free at the latter address.

<sup>2</sup> BILOG is a product of Scientific Software International, 7383 N. Lincoln Ave., Suite 100, Lincolnwood, IL 60712-1704. Their web home page is <www.ssicentral.com> with specific information about Bilog at <www.ssicentral.com/irt/bilog.htm>

### ***Scale Metrics***

The Rasch-based scale is an interval measure, but not a ratio measure. That is, the relative size of the intervals is meaningful but the zero point is not. This can be inferred from the basic formulation of the Rasch model above. Scale scores enter the equation only as the differences between household scores and item scores. Thus, any constant can be added to the scores, so long as it is added to both household and item scores. To compare two scales, or two sets of household scale scores, the two scales must be set to comparable zero points. The recommended way to accomplish this is to adjust the scales so that the mean of the item calibrations is the same in both scales. Selection of the mean is arbitrary from a computational point of view, but it may be important from a communications perspective.

The size of the interval on the scale can also be adjusted by a constant ratio. This requires dividing the (h-i) terms in the equation above by a constant. This constant may be referred to as a scale factor since, in effect, the adjustment multiplies the item calibrations and the household scale scores by this constant. Thus, a Rasch-based scale may be seen to be invariant, in principle, under any linear transformation. However, the natural logistic formulation (i.e., with a scale factor of 1) may be more intuitively accessible and is the default for most software packages.

For computation and data products, the current standard scale metric used by the Federal food security measurement project is based on a scale factor of 1 and a mean item calibration of 7. This accommodates a (positive) scale range from zero to 14, which is slightly larger than the full range observed so far in fitting the measurement model to the 1995-1998 CPS food security data. The household scale scores in the CPS Food Security Supplement microdata files for the September 1996, April 1997, and August 1998 data, and for the revised April 1995 data, are all based on this metric. The mean of 7 assures that all household scores will be positive, which facilitates presentation and communication. Hereafter this metric is referred to as the “standard computational metric.” Based on 1998 item calibrations, household scale scores on this metric (except for households that affirmed no items, see below) extend from 1.4 to 13.0.

For presentation and policy communication purposes, a scale extending from 0 to 10 is deemed to be more effective than a scale of 0-14, and this is the basis of the table of household scores in

Chapter 2. This scale was calculated by multiplying scale scores based on the standard computational metric by 10/14, or 5/7. Thus, it is equivalent to a scale with a scale factor of 5/7 (= .7143) and a mean item calibration of 5. Hereafter this metric is referred to as the “standard 0-10 metric.”

Item calibrations and household scores presented in the remainder of this appendix are on the standard computational metric, i.e., with scale factor of 1 and mean item calibration of 7. If the user prefers to present results on the standard 0-10 metric, calculations can be carried out in the standard computational metric and then scale scores for items or households multiplied by 5/7.

**NOTE:** Data products and publications based on the initial work on the 1995 data used several different metrics. The April 1995 microdata file provided by the Census Bureau on CD-ROM or FERRET used a metric based on a scale factor of 1 and a mean item calibration of 6. The Summary Report (Hamilton et al. 1997a) used a 0-10 metric based on a scale factor of 5/6 and mean item calibration of 5, although this was only used for illustrative purposes in two graphics. The Technical Report (Hamilton et al. 1997b) used a metric based on a scale factor of 1 and mean item calibration of zero in Chapter 2, and reproduced in Chapter 4 a graphic from the Summary Report based on the 0-10 metric used in that report. The Guide to Implementing the Core Food Security Module (Price et al. 1997) used the 0-10 metric based on a scale factor of 5/6 and mean item calibration of 5 except in Appendices C and D, where item calibrations are presented on a metric with scale factor of 1 and mean item calibration of zero.

### ***Extreme Households***

The Rasch model cannot calculate scale scores for extreme households--those that affirm all items, or that affirm no item--and such households cannot be used to estimate item calibrations.<sup>3,4</sup> For the few households that affirm all items, the standard solution for this problem is to assign them the score corresponding to affirming 17.5 items for households with children, and 9.5 items for households with no children.

Assigning an appropriate score to households that affirm no items (raw score=0) is more problematic, however. Categorical assignment is clear. These households are food secure. But the

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<sup>3</sup> Software packages may assign scores to these households, but they are somewhat arbitrarily assigned by the software, not calculated under Rasch assumptions.

<sup>4</sup> The Rasch model also cannot calculate item calibrations for items that are affirmed by all households nor for those that are denied by all households. In most cases this is not problematic, but it can occur for some subpopulations.

appropriate scale score is not obvious. How food secure are they? For communication purposes, a score of zero is appropriate on either the standard computational metric or the standard 0-10 metric. For analytic purposes, however, no single score is necessarily correct. Depending on the association under investigation, the researcher will need to make appropriate adjustments to this assignment or assign lower weights to these households to reflect the imprecision of the measure for them, or exclude them from the analysis. To draw researchers' attention to this problem, the CPS Food Security Supplement microdata files assign a household scale score of -6 rather than 0 to households affirming no items. The September 1996 and April 1997 files further distinguish households that were screened out of the core module (and, thus, never were asked any of the items) by assigning a household scale of -5 to such households.<sup>5</sup>

### ***Imputation and Missing Items***

Data used for calculating item calibrations should not include imputation for missing data. However, items that were skipped because of internal screening should be imputed as negative responses, as should frequency-follow-up items ("how often did this occur?") that were skipped because the respondent denied the base item. Child-referenced items in households with no children should be set to missing.

Rasch software will calculate household scale scores for households with missing items provided at least some items have valid responses (and provided at least one, but not all, of the valid responses is affirmative). Indeed, one of the strengths of the Rasch model is its ability to deal with missing data in statistically sound ways. These household scale scores may be used directly. Alternatively, subsequent to scaling, missing items may be imputed following the imputation procedures outlined in chapter 3. Household scale scores for these households can then be calculated by resubmitting their adjusted responses, with missing items now imputed, to the Rasch software with item calibrations anchored at the values calculated previously.

---

<sup>5</sup> The original April 1995 Food Security Supplement data did not follow this convention. Households affirming no items were assigned a scale value of zero. The revised data which will be released in the near future follow the standard used in the 1996 and later data.

**Item Calibrations**

**Exhibit C-1** presents the item calibrations for the core 18 items. These are based on the August 1998 CPS Food Security Supplement data, and were calculated using weighted data. Earlier years' Food Security Supplements administered the core items in a substantially different order and did not use the internal screening that has become standard beginning with the August 1998 CPS. Since the core module as currently standardized is consistent with the August 1998 design, the 1998 calibrations are appropriate for use either as a comparison or to anchor item calibrations for data collected using the core module.

**Exhibit C-1**

**Item Calibration Values: 1998 National Benchmark Levels<sup>a</sup>**

Questionnaire Item Number <sup>b</sup>	Item Description	Item Calibration <sup>c</sup>
2	Worried food would run out	1.488
3	Food bought didn't last	2.793
5	Relied on a few kinds of low-cost food for children	3.268
4	Couldn't afford to eat balanced meals	3.669
6	Couldn't feed the children a balanced meal	5.040
8	Adult cut size of meals or skipped meals	5.374
9	Respondent ate less than felt they should	5.534
8a	Adult cut or skipped meals, 3 or more months	6.424
7	Children not eating enough	6.661
10	Adult hungry but didn't eat	7.545
11	Respondent lost weight	8.613
13	Cut size of child's meals	8.791
12	Adult did not eat for whole day	9.122
15	Child hungry but couldn't afford more food	9.240
12a	Adult did not eat for whole day, 3 or more months	9.934
14	Child skipped meal	9.935
14a	Child skipped meals, 3 or more months	10.627
16	Child did not eat for whole day	11.944

<sup>a</sup> Based on August 1998 Current Population Survey Food Security Supplement data.

<sup>b</sup> Items are ordered in the table by severity as reflected in item calibrations. This differs slightly from the order of administration in the questionnaire.

<sup>c</sup> Calibrations are based on the standard computational metric (i.e., with scale factor of 1 and mean item calibration of 7).

Source: Calculated by ERS based on U.S. Census Bureau data from the Food Security Supplement to the August 1998 Current Population Survey.

**Household Scale Scores and Thresholds**

**Exhibit C-2** presents household scale scores on both the standard computational metric and the standard 0-10 metric. The latter are identical to those presented in exhibit 3-5, and are repeated here for comparison.

**Exhibit C-2**

**Alternative Standard Metrics for 1998 Scale Values**

Number of "yes" responses		1998 Scale Value		Food Security Status Category
Household with child	Household with no child	Standard Computational Metric	Standard 0-10 Metric	
0	0	0.0*	0.0*	Food secure
1		1.4	1.0	
	1	1.7	1.2	
2		2.6	1.8	
	2	3.1	2.2	
3		3.4	2.4	Food insecure without hunger
4		4.1	3.0	
	3	4.2	3.0	
5		4.8	3.4	
	4	5.2	3.7	
6		5.4	3.9	
7		6.0	4.3	
	5	6.2	4.4	Food insecure with hunger, moderate
8		6.6	4.7	
	6	7.1	5.0	
9		7.2	5.1	
10		7.7	5.5	
	7	8.0	5.7	
11		8.3	5.9	
12		8.8	6.3	
	8	9.0	6.4	Food insecure with hunger, severe
13		9.3	6.6	
14		9.8	7.0	
	9	10.1	7.2	
15		10.4	7.4	
	10	11.1*	7.9*	
16		11.1	8.0	
17		12.2	8.7	
18		13.0*	9.3*	

\* Note on next page.

Source: Calculated by ERS based on U.S. Census Bureau data from the Food Security Supplement to the August 1998 Current Population Survey.

If Rasch software is used to assign scale scores to households with partially missing data, those households' scale scores will fall between the tabled values, which correspond to complete-data households. To assign such households to the appropriate food security status category, precise thresholds must be defined for each category. For example, if a household has a scale value less than 3.1 on the standard computational metric, it is clearly food secure. But if it has a scale value between 3.1 and 3.4, its food security status category cannot be assigned without knowing precisely where the threshold is between the food-secure and food-insecure categories. The recommended method is to set each threshold at the midpoint between the scale values of the complete-data household score groups just below and above the threshold. This is somewhat arbitrary, but since missing items are rare in a properly administered survey using the core module, the decision has little substantive import.

If household scores are to be assigned based on item calibrations calculated from the data collected, rather than on the national standard item calibrations, the following procedure can be used to establish the categorical thresholds. First, create a table similar to Exhibit C-2, with household scale scores based on households with complete data. These can be identified from the initial Rasch analysis in which item calibrations are calculated. Categories defined in terms of raw scores will remain as in Exhibit C-2. Then, set the category thresholds at the midpoint of the household score just above and just below the category boundary (as was described in the preceding paragraph).

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\* Note for Exhibit C-2:

Scale scores for extreme households--i.e., those affirming no items or all items--cannot be calculated under Rasch model assumptions. Here the score of 0 for no affirmatives is arbitrary and researchers should omit the category from associative analyses or use appropriate techniques to allow the implied scale value to be estimated in the equation. There are very few households that affirmed all items. Scores for these households are calculated at 17.5 affirmatives for households with children and 9.5 for households without children.

**APPENDIX D**

**Further Technical Notes**

**Technical Note 1. Correspondence of Item Numbers**

The following information on variable naming conventions will help the user make sense of the CPS Food Security Supplement variable names: The initial “HES” in the CPS variable names indicate that the variables are “Household, Edited, Supplement” variables. The remaining characters indicate the questionnaire item number corresponding to the variable. Beginning in 1998, the questionnaire item numbers include prefixes (after the initial HES) that correspond to the “Stages” in the core module. S2-S6 are food security items (Stage 1 items in the Core Module), H1-H5 are hunger items (Stage 2 items in the Core Module), and SH1-SH5 are severe hunger items (Stage 3 items in the Core Module). Finally, an “F” in this prefix indicates a frequency-of-occurrence follow-up to the item with the same number.

**Exhibit D-1**

**Correspondence of Item Numbers in the Core-Module Questionnaire  
and Current Population Survey Food Security Supplements**

Item (short form)	Core Module	CPS Food Security Supplements:	
		1995-1997	1998-2001
Worried food would run out	Q2	HES53	HESS2
Food bought just didn't last	Q3	HES54	HESS3
Couldn't afford balance meals	Q4	HES55	HESS4
Few kinds of low-cost food for children	Q5	HES58	HESS5
Couldn't feed children a balanced meal	Q6	HES56	HESS6
Children were not eating enough	Q7	HES57	HESH1
Adult(s) cut or skipped meals	Q8	HES24	HESH2
Adult(s) cut or skipped meals, 3+ months	Q8a	HES25	HESHF2
You ate less than felt you should	Q9	HES32	HESH3
You were hungry but didn't eat	Q10	HES35	HESH4
You lost weight because not enough food	Q11	HES38	HESH5
Adults did not eat for whole day	Q12	HES28	HESSH1
Adults did not eat for whole day, 3+ months	Q12a	HES29	HESSH1F1
Cut size of children's meals	Q13	HES40	HESSH2
Children ever skip meals	Q14	HES43	HESSH4
Children skip meals, 3+ months	Q14a	HES44	HESSH1F4
Children ever hungry	Q15	HES47	HESSH3
Children did not eat for whole day	Q16	HES50	HESSH5

**Technical Note 2 -- Comparison of 1995 and 1998 Standard Household Scale Values**

Household scale values presented in the original (1997) *Guide to Implementing the Core Food Security Module* differ somewhat from those in this revised *Guide* (Chapter 3, Appendix C, and Exhibit D-2). Two reasons account for these differences. First, the item calibration values in

**Exhibit D-2**

**Comparison of 1995 and 1998 Standard Household Scale Values**

Number of "yes" responses		Household Scale Values		Food Security Status Category
Household with child	Household with no child	1995 Original 0-10 Metric <sup>a</sup>	1998 Standard 0-10 Metric <sup>b</sup>	
0	0	0.0*	0.0*	Food secure
1		0.7	1.0	
	1	0.9	1.2	
2		1.6	1.8	
	2	1.9	2.2	
3		2.2	2.4	Food insecure without hunger
4		2.7	3.0	
	3	2.8	3.0	
5		3.3	3.4	
	4	3.5	3.7	
6		3.7	3.9	
7		4.2	4.3	Food insecure with hunger, moderate
	5	4.2	4.4	
8		4.6	4.7	
	6	4.9	5.0	
9		5.1	5.1	
10		5.5	5.5	
	7	5.7	5.7	
11		5.9	5.9	Food insecure with hunger, severe
12		6.4	6.3	
	8	6.5	6.4	
13		6.8	6.6	
14		7.2	7.0	
	9	7.4	7.2	
15		7.7	7.4	
	10	8.1*	7.9*	
16		8.3	8.0	Food insecure with hunger, severe
17		9.2	8.7	
18		10.0*	9.3*	

a, b, \* Notes on next page.

1998 differed slightly from those calculated from the 1995 data, due mostly to the revised item order in the 1998 Food Security Supplement.

Second, although both sets of scores extend across approximately the same measurement range, they are based on slightly different metrics (units of measure). Both metrics have a mean item calibration of 5, but the 1995 scores are based on a scale factor of 5/6, while the 1998 scores are based on a scale factor of 5/7. This change was necessary in 1998 in order to keep the values within the 0-10 range. The 1995 scores are nearly perfectly linear with respect to the 1998 scores, so findings from analyses based on the earlier scores will be unaffected by the changes. Food security status categories were not affected by these changes, and these categories are completely consistent between the two *Guides* for households with the same number of affirmative responses.

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Notes for Exhibit D-2:

<sup>a</sup> *Guide to Implementing the Core Food Security Module* (1997), Exhibit 2-5, p. 21. Note that Exhibit 2-6, p. 24, includes errors in the scale-score ranges presented. Corrected values for these ranges (rounded) are: 0.0-2.0; 2.1-4.3; 4.4-6.6; and 6.7-10.0.

<sup>b</sup> Taken from Exhibit 3-3 above (p. 34) or Exhibit C-2 (p. 71).

\* Scale scores for extreme households--i.e., those affirming no items or all items--cannot be calculated under Rasch model assumptions. Here the score of 0 for no affirmatives is arbitrary and researchers should omit the category from associative analyses or use appropriate techniques to allow the implied scale value to be estimated in the equation. There are very few households that affirmed all items. Scores for these households are calculated at 17.5 affirmatives for households with children and 9.5 for households without children.